

# PLASTICS & MOLDDED PRODUCTS

Volume 8

JANUARY 1932

Number 1



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## Demand for Urea-Type Plastics Raises Production to Tonnage Basis

By R. S. Childs

President, Synthetic Plastics, Co., Inc.

**M**OLDING powders of the urea formaldehyde type have been on the American market since 1929—one of the first products offered commercially being Beetle molding powder, made and marketed by the Synthetic Plastics Company, a subsidiary of the American Cyanamid Company.

This Company's original product contained thiourea and urea, and, for a time, was sold at 60c a pound to a somewhat limited group of molders who were in a position to provide the type of presses, the protected environment for the exclusion of dust and other contaminants and the special technical attention which the effective commercialization of the product required in order to perfect its adaptation to American molding practice and climatic conditions.

### Slow, Steady Growth

The wisdom of this cautious policy has been justified, inasmuch as it was found that American conditions were in some respects subtly different from those in England, where Beetle has been on the market for two years longer than it has here.

By keeping the business within a small family of molders, the manufacturers were able to deal

conveniently with the numerous minor technical problems which arose. The presence of thiourea in this product made it necessary for the molder to provide stainless steel or chromium plated molds to prevent the staining effect which thiourea has on ordinary steel.

The material was supplied in the form of a finely divided powder, which could not be readily tabletted, and the molding cycle was slowed up as compared with the familiar phenolic powders, because of the necessity of breathing the molds after partially closing, in order to release the imprisoned air. Establishing the correct molding cycle for Beetle was often a problem which required considerable study and experimentation in the molding room.

Despite these working limitations of the urea-thiourea product, many beautiful molding jobs were run, some of the most conspicuous being certain items of the Telechron clock line, the Beetleware line of tableware, and the Beetleware tumblers seen in the drug and department stores, where they are sold for nursery, picnic and bath-room use and are commonly, though erroneously called by the public "unbreakable tumblers."

For such items, the new molding powder enjoyed the unique advantage of translucent color. The natural color of the material is ivory, permitting easy tinting with either dyes or pigments to produce any color in the rainbow—a marked advantage in colorability as compared with the phenolic powders, whose natural color is dark brown. Against such a base color, pigmentation has to be very heavy, and a full range of colors is not feasible, and in only a few cases can colors be made bright.

### Mold Stain Eliminated

As the manufacturers of Beetle proceeded with an elaborate research program working hand in hand with their commercial efforts, numerous problems were developed and taken care of, and after the English product had thus been successfully Americanized, it was possible to turn the technicians toward the development of urea resins in the hope of getting a commercial product without any thiourea—the latter being not only a trouble-maker by reason of staining molds, but being costly as well.

Urea formaldehyde resins have been made experimentally in Europe and America for a

number of years—the most active of the pioneer producers being Fritz Pollak, of Vienna, who had taken out an extensive group of patents in all countries, including the United States, about seven years ago. Many experimenters have, from time to time, worked with the urea resins, finding them to be erratic and sensitive products which it was very difficult to bring under precise control outside of laboratory-scale operations. The experience with the original Beetle enabled the Synthetic Plastics Company in 1931 to bring out, tentatively, "Beetle 212"—a urea-formaldehyde resin, the first use of which was in the long runs of tumblers and bracelets for the 10c stores. The price was dropped to 35c a lb., where it stands now, and the powder was put into granulated form, which could be tableted and molded in ordinary steel molds with the same speed as the phenolic powders and without danger of staining the molds. After six months of mass production with the tumblers and some scattered production and experimental work with other shapes, the "Beetle 212" is now considered to be fully commercial, and suitable for use by any molder who has appropriate presses and standards of workmanship for handling it with the cleanliness and care which all colored products require. The new Beetle is frequently introduced in presses which are running with phenolic powders, immediately turning out satisfactory white or light colored moldings without substantial alteration of the molding cycle.

#### Simplified Operation

The savings in cost and molding time and the gains due to the ability to use tablets instead of weighing out charges, all combine to make "Beetle 212" now available for any item in the molding field where color is desirable. This includes closures, electrical fittings and all the wide array of small objects and parts for which molded products are especially adapted.

The Synthetic Plastics Company has further fortified its position in the field by acquiring the Pollak patents: 1,458,543; 1,460,606; 1,507,624; 1,625,283; 1,687,312; 1,701,986; 1,762,456; 1,734,693, and 1,779,047, which it believes to constitute the practical foundation of the industry, so far as patents are concerned.

Two other companies, the Aldur Corporation (Aldur molding powder) and the Toledo Synthetic Products, Inc., (Plaskon) are in the market with urea molding powders, and a fourth company, the Unyte Corporation, a subsidiary of the American I. G., is reported to be equipping to enter the field. The Unyte Corporation is sole licensee of certain urea resin patents of Carleton Ellis.

It seems clear that the urea resins are here to stay, for the tonnages that have been successfully used are impressive and a great variety of products have been successfully manufactured in them by a number of molders.

Basically, there is no reason why urea-formaldehyde resins should not be as cheap as phenol-formaldehyde products, since

urea, costing from 5 to 7c a pound, is at least as cheap as phenol. The principal distinction in cost lies in the fact that, with the wide variety of color, the output of these new molding powders is unlikely to be concentrated into long runs of blacks and browns. The cost rises a little where it becomes necessary to stop to wash up and shift apparatus from one color to another. Light colored moldings, likewise, involve a larger number of rejections in the molding plant, inasmuch as minor flaws, dust specks, etc show prominently and care is required to screen the operation against contamination.

#### Costs Differ Slightly

For most moldings, however, the higher prices of the urea powders, as compared with the phenolics and the increased care that must be taken in molding light colors will not make a sufficient difference in the cost of the molded product to interfere seriously with the widespread use of the brilliant, translucent whites and pastel colors which are now made possible by these new urea powders.

Soda fountains that feature the Beautycup Service boast of customers who say "I like to go to that fountain—the service is so attractive." Soda tumblers, sundae cups and banana split dishes, in ivory, coral pink and green Beetle, resist most of the abuses which chip or break glass fountain ware.



Photos Courtesy of Benedict Mfg. Co.

# The Development of Synthetic Resins for Paint and Varnish Formulation

By A. J. Norton

*Chemical Director, General Plastics, Inc.*

**T**HE Plastic industry, long known for the wide diversity of other industries with which it comes in contact as suppliers of raw material, now finds itself engaged in the manufacture of a basic product for the paint and varnish industry. The paint and varnish industry itself is one of the oldest and probably best established industries in the country, whereas the plastics industry evolved from the ancient plastic art only recently, as the result of the ability to manufacture synthetic resins. These organic chemicals are of such a complex nature that for many years they could not be made uniform enough to permit standardized manufacturing processes whether for the molding of a clock case or the cooking of a varnish and also could not be made on a large enough scale and cheap enough to compete with such materials as metal, wood and other building materials on one hand and natural gums on the other.

## The Search for Gum Substitutes

The basis for the development of the modern plastic industry has been the synthetic resins of the thermosetting type, as it is only recently that it has been possible to manufacture resins of the oil soluble or oil reactive type. But these two types are so closely interwoven, chemically and historically that it is impossible to talk of one without talking of the other and to have an understanding of one without an understanding of the other. It is extremely interesting from the historical viewpoint to note that the whole plastic industry, and the thermosetting resins, developed as a

result of wide-spread search among European chemists for a synthetic gum for the paint and varnish trade — specifically for a resin to take the place of shellac. Throughout all the years of research and development of this modern industry, the undertone has been a gum for the paint and varnish trade and it is only recently that this end has been achieved.

By a thermosetting resin or compound is meant a product which will not only melt, flow and take the shape of a mold, but during the interval in which it is subjected to heat and pressure, will set to an infusible, insoluble, chemically inert and lustrous product which may be taken from the hot mold without danger of warping or breaking—a finished product. There are thousands of synthetic resins possible, but resins having the proper characteristics for a particular use and of a nature which lend themselves to commercial production, are few and far between.

Commercial thermosetting resins divide themselves into three types: first, those based on the reaction of phenol and formaldehyde, second those based on a combination of phenol and other aldehydes, such as acetaldehyde, third those based on combinations of other products such as urea or aniline formaldehyde. The ester types of resins such as ester gum which is the glycerine ester of rosin, or chemically abietic anhydride, the ester semipolymerized type such as the glyptals which are made from glycerine and phthalic anhydride and the strictly polymerized products such as the styroles or vinyl condensa-

tion products as a rule do not comply with the requirements of the thermosetting resin. These products are practically all thermoplastic and in those that are not the action of polymerization is not complete enough in the short time of molding or baking to prevent further changes from taking place after the product is taken from the mold. These changes produce strains and effect the durability and the strength of the product. Casein products also come in this class as do the cellulose derivatives. These resins have much more use in the paint and varnish field, but their use is limited by their chemical and water resistance just as it is limited in molding compounds.

## Characteristics

Of the three classes of thermosetting resins, the second class, that is those made from phenol and the higher aldehydes, are very limited in use. It might be stated that as a general rule, the higher the molecular weight of an aldehyde, the slower curing the resulting resin, the weaker and less resistant the resulting product. It can be seen from these statements that the properties of the oil soluble types of resin also follow more or less hand in hand with those of the thermosetting resins, the differences being primarily the degree of solubility. The third class of resins has attracted more commercial attention, primarily in the novelty field. Urea resins are very fast to light, as a rule most of the condensation products of urea and formaldehyde are of the dimethylol urea type. In order



to make these resins thermosetting and water-resistant—for the dimethylol derivatives are water soluble, it is necessary to adjust the pH to a point where the condensation takes place. During this condensation, part of the formaldehyde—that is, about  $\frac{1}{2}$  a mol—is split off. This evolution of formaldehyde is a bad feature in molding and also in baking lacquers, where these resins have been used, as it is readily converted to formic acid in the air and corrodes the molds and finished surface. Urea resins are not as resistant or chemically resistant as those from phenol and formaldehyde.

In other words, because of one or another limitation, no resins, to date, have reached the broad commercial acceptance in the molding industry enjoyed by those based on the reaction of phenol and formaldehyde. This is not so true in the paint and varnish field, altho it is true that no resins have the durability and chemical resistance of those based on the reaction of phenol and formaldehyde. Phenol and formaldehyde resins have everything which is required of a good gum in the paint and varnish trade, except ideal color. The other resins have the color, but not so much of the other properties.

#### First Phenolic Resins

Historically the phenol resins date back to about 1870, altho the fundamental research on phenolic resins was done during the period of 1900 and 1906. The chemical inertness of the products made during this period attracted the attention of almost everybody, but difficulty of control prevented the commercial production of any industrially important products until in 1908 and 1909 when Dr. Baekeland was able to control the reaction between one mol of phenol and formaldehyde to the point where he could obtain a resin which was still fusible and soluble and could be incorporated with fillers giving a thermosetting molding compound. These products were extremely

expensive however, and their use was limited to places where their peculiar electrical properties rendered them almost a necessity. It was not until Dent following in the footsteps of DeLaire, whose work in 1905 showed that the hydroxy benzyl alcohols which are the first stage in the condensation of phenol and formaldehyde in the presence of alkali could be condensed with many other materials than formaldehyde itself, producing quite a wide series of resins and giving a much greater degree of control. As these products became available, at lower prices and more uniformly controlled to permit automatic or semi-automatic molding, the thermosetting industry grew with great leaps and bounds.

#### Fluxed Resinoids

However, all of these products whether the dihydroxy diphenyl methane type of resins which is formed during the acid condensation in the phenol formaldehyde or the hydroxy benzyl alcohol type formed from the alkaline condensation, were insoluble in the oil and solvents used by the paint and varnish trade. About 19 years ago Albert in Germany and later, Fonrobert found that by fluxing these insoluble phenol resins with large amounts of rosin and later ester gum and other natural resins, they could produce a mixture, or colloidal suspension of resin which on incorporation with oil was dispersed even though it was not dissolved. This opened the field for the product which was introduced to this country under the name of Amberol and later similar products were made under different trade names as Beckacite, Paranol, etc. However, in spite of the wonderful improvements made in the varnishes, by the use of these small amounts of phenol resin, the paint and varnish trade was not satisfied, for in using this product it was necessary to use the 75 or 80% of ester gum that was mixed with it, whether they desired this formula or not.

By careful study of the soluble isomers of the resins formed by the DeLaire process, it was finally found in the General Plastics laboratory that when one of these isomers was combined with other products, a phenol resin resulted which was very soluble in oils. This resin even though it was dark in color, was basically different from any resin on the market and was marketed under "No. 500". The durability of the films made from this product were remarkable and other features—such as nonskinning, one of the difficulties with most phenolic resin varnishes previously, and nonwrinkling of a baked film—were outstanding. It showed its different characteristics also in that it did not accelerate the drying as the ordinary insoluble type of phenol formaldehyde resin did when introduced into the varnish by fluxing. In fact, if anything, the No. 500 retarded the drying somewhat. The yellowing which is characteristic of phenol resins, was also one of the draw-backs in the 500 resin and by careful study of the reaction and steady improvement in control, it was possible to eliminate some of the impurities which had retarded the drying and caused the yellowing. The 550 resin now on the market is an all-phenol resin extremely soluble in oils and which can be cooked in almost any type of cook desired by the varnish maker, used as a reducing gum from high heat when cooking congo varnishes, or introduced as a straight Durez varnish which can be blended with other varnishes without danger of becoming "lousy".

#### Improved Phenolic Resins

The durability of varnishes made with phenol resins is a byword in the paint and varnish trade and there is no question whatever in the minds of any of the people in the trade as to the improvement in this respect. Durability of lustre as well as actual wearing qualities is im-

(Continued on page 41)



# Growing Synthetic Plastic Industry Boosts Production of Coal Tar Chemicals

By J. N. Taylor

Chemical Division, U. S. Department of Commerce

**A**LTHOUGH in the first stages of its development, the synthetic resins industry gives promise of becoming one of America's foremost activities. Because of their great utility and wide distribution, the importance of synthetic resins in everyday life is becoming more and more apparent. Their diversified uses, from bottle caps and radio parts to timing gears and furniture, as well as their employment in the automobile, structural, electrical, and marine industries, and in the manufacture of varnishes and lacquers, are familiar to all. Not only are new uses being found for the older types of synthetic resins, but new materials from new sources are being added to the ever-growing list. Since color can be incorporated with them, their appeal to beauty, both of form and color, finds expression in articles having all the rainbow hues and now found in the market in the form of various picnic wares, tea sets, boudoir ensembles, bathroom and motor-car fittings, and other molded articles. The increased demand, for synthetic resins chiefly of coal-tar origin, is primarily responsible for the unusually large consumption of both phenol and cresylic acid in recent years. In 1930 production of phenol alone amounted to over 21,000,000 pounds, worth more than \$2,000,000.

## Carbolic Raw Materials in Demand

Members of a homologous series of phenols, both phenol and cresylic acid, are found in coal tar, from which they are obtained by distillation and subsequent fractionation and purification. Phenol is also manu-

factured synthetically, using benzol as a basic material, the synthetic variety competing today with "natural" phenol. In addition to their employment in the manufacture of synthetic resins, both phenol and cresylic acid find use as ingredients of insecticides and disinfectants. Phenol is used also in the production of explosives and as an intermediate in the manufacture of coal-tar dyes, while important uses for cresylic acid are in the manufacture of tricresyl phosphate and as a flotation agent.

## Consumption Channels Expanding

A domestic production in 1930 of more than 21,000,000 pounds of phenol, approximately 70 per cent of which was synthetic, took care of home requirements, imports during that year amounting to only 500 pounds. Total domestic cresylic acid requirements necessitated the importation in 1930 of over 10,000,000 pounds in addition to a domestic production of 17,300,000, pounds of the refined grade—distillates yielding below 215° C., tar acids equal to more than 75 per cent of the original distillate.

Although large stocks of phe-

nol were on hand at the close of the World War—aggregating around 35,000,000 pounds—the steadily increasing demand gave rise to an increasing domestic production, reaching a peak in 1929. Coincident with an increased production there has been a lowering of imports. Statistical data for recent years are shown in Table I.

## Cresylic-Acid Imports Necessary to Meet Requirements

Although domestic production of cresylic acid has increased in late years, it has been necessary to import this material in order to supply the larger consumption requirements. Imports are chiefly from the United Kingdom and Germany. In Table II are shown imports entered for consumption of (1) crude cresylic acid (free); (2) refined cresylic acid (cresol or liquid carbolic acid) (dutiable); and (3) orthocresol, metacresol, and paracresols, 90 per cent or more pure (dutiable).

A group of tar acids containing practically no phenol, small quantities of the cresols, and proportionately larger amounts of the xylenols is obtained from the tar produced by cooling the waste gases from blast furnaces

Table I

United States production, <sup>1</sup> sales, <sup>2</sup> and imports of phenol					
Year	Production (pounds)	Domestic Pounds	Sales Value	Imports for consumption Pounds	Value
1926	8,691,181	5,479,727	\$ 987,631	218,437	\$47,351
1927	8,041,082	4,595,162	684,160	500	100
1928	10,227,489	7,745,650	912,304	1,653	298
1929	24,177,618	19,938,503	2,248,288	433,385	44,226
1930	21,147,436	17,714,678	1,976,310	500	115

<sup>1</sup> Reported to the United States Tariff Commission.

<sup>2</sup> Exclusive of amount consumed within producing establishment.

Reprinted from Commerce Reports.

or that produced during the thermal decomposition of coal in vertical retorts. Of late, the tar produced during the low-temperature carbonization of coal has become another source of high-boiling phenolic or phenoloid bodies. Some of this type of phenols finds its way into commercial articles used in disinfection, markedly increasing their bacterial efficacy.

Imports of "distillates of coal, blast-furnace, oil-gas, and water-gas tar," answering certain specifications as to boiling point and tar-acid content, practically have disappeared.

Imports into the United States for consumption of all other distillates, n.s.p.f., which yield in the portion distilling below 190° C. a quantity of tar acids less than 5 per cent of the original distillate, show the following variations: 1925, 5,994,803 pounds, \$367,672; 1926, 3,136,838 pounds, \$197,009; 1927, 68,748 pounds, \$7,405; 1928, 539,641 pounds, \$26,001; 1929, 298,619 pounds, \$18,845; and 1930, 347,923 pounds, \$11,953. Preliminary data for the first half of 1931 are 186,921 pounds \$6,728.

Exports of phenol have not been recorded since 1924. At that time outbound shipments went to 28 world markets, principally to Latin American countries. The United Kingdom, Canada, China, and the Philippines took small quantities.

Table II						
Imports for consumption of cresylic acid into the United States						
Year	Crude cresylic acid		Refined cresylic acid		Orthocresol, metacresol, and paracresol, 90 per cent or more purity	
	Pounds	Value	Pounds	Value	Pounds	Value
1926	5,702,740	\$331,550	25,932	\$ 4,748	105,238	\$15,040
1927	9,136,516	567,802	610,488	37,896	174,094	35,054
1928	10,687,109	678,177	976,180	70,513	207,897	33,638
1929	17,856,765	952,110	2,343,529	183,324	227,974	32,098
1930	9,009,674	501,418	1,257,872	96,047	202,317	26,735
1931 <sup>1</sup>	2,488,398	128,125	404,350	25,717	90,602	16,034

<sup>1</sup> 6 months—preliminary.

Cresylic acid exports are negligible, 1,039,532 pounds, valued at \$92,106, being exported in 1929, with the benefit of drawback.

### Rapid Growth in Synthetic Resins

Originally an American achievement, this country has contributed largely of its inventive genius and merchandising skill to the synthetic resin field. The pioneer type—the phenol-formaldehyde resins—was followed by the coumarone and indene resins, the urea and furfural products, the glyptals, and the "sulphur," resorcinol, and vinyl resins.

In 1930, synthetic resins of coal-tar origin reached a domestic production figure of over 30,000,000 pounds, 20 times as much as in 1921, when 1,500,000 pounds comprised the United States output. Of the total

1930 production of coal-tar synthetic resins, 60 per cent was derived from phenol and the cresols (cresylic acid).

Imports of phenolic synthetic resins reached a peak in 1928 when 60,547 pounds, valued at \$10,984, were entered for consumption. The amounts dropped to 11,359 pounds, \$4,266, in 1929 but advanced again to 46,464 pounds, \$10,417, in 1930.

An increased domestic production now permits the exportation of this class of products, outbound shipments of laminated sheets and plates and other coal-tar resin products going to 27 world markets. In the following Table III are listed recent exports to the principal countries of destination.

Again creative chemistry has utilized old materials and made possible new markets. Growth and progress, no doubt, will be rapid and the future of this youthful industry appears promising.

Table III.

United States exports of synthetic resin sheets, plates, and manufactures

Country of destination	1930	First 6 months of—	
		1930	1931 <sup>1</sup>
Canada	\$ 88,353	\$39,916	\$ 54,740
United Kingdom	28,096	10,146	35,921
France	23,424	3,379	7,054
Italy	13,532	5,568	1,170
Germany	4,615	874	1,046
Australia	4,609	4,187	408
Cuba	1,591	586	1,020
Mexico	258		1,018
Argentina	160		966
Japan	1,601		651
Other Countries	7,405	2,337	3,868
Total	173,644	66,993	107,862

<sup>1</sup> Preliminary.

### Resopal—New Synthetic Resin

A new pressed material has recently been evolved in Germany by H. Roemmler A. G., of Spremberg. It has the same qualities as synthetic resin and is known as "resopal." It is produced in a wide variety of colors, including white, marbled and translucent effects, and is suitable for the manufacture of bowls, tumblers, plates, cups, trays, etc. It is also useful for producing heavier articles, such as light fittings, hanging lamps and standard lamps, and is particularly suitable for switches.

PLASTICS & MOLDED PRODUCTS

# Technology of Cellulose Acetate

Progress in the Preparation of this Cellulose Ester as Shown  
in the World's Patent Literature during the last Decade

By Dr. Aladin

*Continuing this concise but comprehensive review of the world's patents on Cellulose Acetate which issued during the past decade, we now come to those patents which particularly relate to the*

## IV. Acetylation

(Continued from page 606, November 1931 issue)

Serial No.	Patent No.	Patentee	Title	Brief of Description
161.	F. P. 473,399	Societe Chimique des Usines du Rhone	Preparation of Cellulose Esters.	See B. P. 146,092 (No. 136).
162.	F. P. 600,080	H. J. Mallabar	Manufacture of Cellulose Acetate.	See U. S. P. 1,652,573 (No. 123).
163.	F. P. 600,278	Ketoid Co.	Manufacture of Cellulose Acetate.	See U. S. P. 1,604,471 (No. 122).
164.	F. P. 632,615	C. Dreyfus	Manufacture of Cellulose Esters.	See B. P. 269,530 (No. 148).
165.	F. P. 658,324	Fabrick van Chemische Produkten	Manufacture of stable highly acetylated cellulose acetate.	Cellulose is acetylated in the presence of sulfuric acid to the very highest degree obtainable. The excess of acetic anhydride is then destroyed and the mixture is allowed to stand until the complete liberation of sulfuric acid from the cellulose aceto-sulfate has taken place, whereupon the product is precipitated by pouring the mixture into water.
166.	F. P. 660,394	Ruth-Aldo Co.	Manufacture of Cellulose Esters.	See B. P. 303,135 (152).
167.	F. P. 660,925	Ruth-Aldo Co.	Manufacture of Cellulose Esters of Fatty Acids.	See B. P. 303,491 (No. 154).
168.	F. P. 663,268	G. W. Morden	Manufacture of Cellulose Acetate.	Cellulose is first treated with a mixture of glacial acetic acid, acetic anhydride and sulfuryl chloride; during the second phase of the process the sulfuryl chloride is replaced by sulfuric acid; finally water is added to effect hydrolysis to form an acetone-soluble product.
169.	F. P. 664,214	I. G. Farbenindustrie A.-G.	Manufacture of Cellulose Esters in two stages.	Cellulose is first treated with a mixture containing a fatty acid and a relatively large amount of fatty acid anhydride but with only a small amount of a catalyst; later on sulfuric acid amounting to more than 1% on the weight of the cellulose is added; finally the balance of the acetic or other anhydride is added; twice the amount of the cellulose at least.
170.	F. P. 664,459	I. G. Farbenindustrie A.-G.	Manufacture of Cellulose Esters.	See B. P. 301,036 (No. 151).
171.	Dutch P. 16,355	Ketoid Co.	Manufacture of Cellulose Acetate.	See U. S. P. 1,604,471 (No. 122).
172.	Norw. P. 42,722	Ketoid Co.	Manufacture of Cellulose Acetate.	See U. S. P. 1,604,471 (No. 122).
173.	Aust. P. 88,638	Society for Chemical Industry	Manufacture of Cellulose Acetate.	See Ger. P. 335,359 (No. 133) and Swiss P. 90,874 (No. 175).



Serial No.	Patent No.	Patentee	Title	Brief of Description
174. Swiss	87,761	Society for Chemical Industry	Manufacture of Highly Viscous Cellulose Acetate.	Cellulose is treated for acetylation but with the use of non-solvents for the resulting cellulose acetate. Temperatures range below 20° C., and acetic anhydride performs the acetylation. Catalysts employed are sulfuryl chloride or a mixture of zinc chloride and phosphorus pentachloride. There results a glass-like clear gell that is not soluble even in an excess of glacial acetic acid.
175. Swiss P.	90,874	Society for Chemical Industry	Manufacture of Highly Viscous Cellulose Acetate (addition to Swiss P. 87,761 (No. 174).	Slightly nitrated cellulose is treated in the presence of a catalyst such as zinc chloride or phosphorus pentoxide at temperatures below 20° C. with acetic anhydride, but without the use of any diluents. The reaction-mixture does not liquefy.
176. Swiss P.	93,814	H. Dreyfus	Manufacture of Cellulose Acetate.	Cellulose is immersed in an acetylating mixture containing up to 10 to 15% of sulfuric acid as calculated on the weight of the cellulose; the mixture being initially cooled to zero centigrade. The temperature during the ensuing reaction rises, but should not be allowed to exceed 25° C. The resulting product is soluble in chloroform.
177. Swiss P.	95,042	H. Dreyfus	Manufacture of Cellulose Acetate.	One part of cellulose is immersed in less than three parts of an acetylating mixture cooled to zero ° C., the said mixture containing from 5 to 20% of sulfuric acid on the weight of the cellulose. The temperature should at no time be allowed to rise to above 35° C. The product is insoluble in chloroform but soluble in acetone.
178. Swiss P.	96,140	Societe Chimique des Usines du Rhone	Manufacture of Cellulose Acetate.	See B. P. 146,092 (No. 136).
179. Swiss P.	103,858	J. O. Zdanovich	Manufacture of Cellulose Acetate.	See U. S. P. 1,445,382 (No. 86).
180. Swiss P.	104,294	J. O. Zdanovich	Manufacture of Cellulose Acetate.	See U. S. P. 1,528,810 (No. 89).
181. Swiss P.	105,945	H. Dreyfus	Manufacture of Cellulose Acetate.	See U. S. P. 1,708,787 (No. 125).
182. Swiss P.	126,588	British Enka Artificial Silk Co.	Manufacture of Cellulose Acetate.	See B. P. 263,771 (No. 147).

## V. Hydrolysis of Cellulose Acetate

183. U. S. P.	1,396,878	M. E. Putnam (Dow Chemical Co)	Preparation of Cellulose Esters.	Cellulose acetate made with an excess of acetic anhydride is poured into a mixture of already hydrolyzed cellulose acetate, acetic acid and water.
184. U. S. P.	1,521,876	E. S. Farrow (Eastman Kodak Co)	Altering the Solubility of Cellulose Acetate.	Primary, chloroform-soluble cellulose acetate is rendered acetone-soluble by immersing the same in finely divided condition at between 7-27°C. in 45-80% nitric acid.
185. U. S. P.	1,557,147	E. S. Farrow (Eastman Kodak Co)	Preparation of Acetone-Soluble Cellulose Acetate.	Chloroform-soluble cellulose acetate is dissolved at ordinary temperature in phosphoric acid of above 60% strength and allowed to stand until samples precipitated by water, are found to be acetone-soluble. The entire mass is then precipitated by pouring it into water, and the acetate is washed, and then dried.
186. U. S. P.	1,560,554	E. S. Farrow (Eastman Kodak Co.)	Separation of finely divided cellulose acetate from highly viscous acetylating mixtures.	The finished acetylated mixture is placed in a kneading apparatus in which it is treated with less than its own weight of water, which is added slowly and gradually.



Serial No.	Patent No.	Patentee	Title	Brief of Description
187.	U. S. P. 1,634,986	E. S. Farrow (Eastman Kodak Co.)	Preparation of Acetone Soluble Cellulose Acetate.	Chloroform soluble cellulose acetate is treated in acetic acid solution with aqueous phosphoric acid, and the resulting mixture is sprayed into heated air, the final dry pulverulent product being then washed with water to remove the therein contained phosphoric acid.
188.	U. S. P. 1,635,026	R. Praybutt and E. S. Farrow (Eastman Kodak Co.)	Preparation of Acetone Soluble Cellulose Acetate.	Finely pulverized cellulose acetate is allowed to be immersed in about 10% nitric acid until it has become soluble in acetone.
189.	U. S. P. 1,658,368	L. E. Branchen and C. U. Prachel (Eastman Kodak Co.)	Lowering the Viscosity of Cellulose Acetate.	A solution of cellulose acetate in either formic or acetic acid is treated with ultra-violet radiation until the desired lowering of the viscosity has been attained.
190.	U. S. P. 1,668,946	H. T. Clarke & C. J. Malm (Eastman Kodak Co.)	Reacetylation of partly de-acetylated cellulose.	Cellulose acetate which has been hydrolyzed to a point where it is no longer soluble in acetone may readily be reconverted into the soluble variety by mere treatment with glacial acetic acid, without using any catalyst nor acetic anhydride.
191.	U. S. P. 1,723,614	Dr. A. Wacker, Ges. f. Elektrochemische Industrie m. b. H.	Preparation of relatively viscous acetone-soluble cellulose acetate.	Chloroform-soluble cellulose acetate is treated below 30°C. with acid salts containing water of crystallization, and, for example as zinc or mercury, or with neutral or other acid salts.
192.	Ger. P. 346,672	Knoll & Co.	Preparation of readily soluble cellulose esters. (addition to Ger. P. 297,504).	Solution of cellulose acetate in 90% formic acid or other water-containing acid such as acetic acid are heated to 90-100° C. until the acetate has become clearly soluble in acetone.
193.	Ger. P. 347,817	Knoll & Co.	Preparation of readily soluble cellulose esters. (Addition to Ger. P. 297,504).	Cellulose esters are treated while dissolved in organic acids containing some water at fairly high temperatures until they have attained the desired solubility in alcohol or a mixture of chloroform and alcohol.
194.	Brit. P. 213,631	L. A. Levy	Preparation of cellulose acetate.	The cellulose acetate while still dissolved in the acetylating bath is subjected to hydrolysis, whereby the viscosity of the solution is reduced. After filtration of the solution, the cellulose acetate is precipitated by means of water.
195.	Brit. P. 267,569	H. Pringsheim	Conversion of cellulose acetate.	Primary cellulose acetates of high molecular weight are treated by heating them in an inert substance such as naphthalene or tetrahydronaphthalene, whereby they become depolymerized and become both more soluble and less viscous.
196.	Brit. P. 273,743	British Celanese, Ltd. (G. Schneider and C. Dreyfus)	Lowering the viscosity of cellulose esters.	The acetylating mixture while still containing the cellulose acetate is treated with hydrogen dioxide and an iron salt such as ferrous acetate, and is allowed to stand for some time before precipitating the cellulose acetate.
197.	Brit. P. 275,286	H. Dreyfus	Preparation of cellulose esters for films, filaments, etc.	By the addition of definite amounts of water to the acetylating bath containing the dissolved cellulose acetate, the process is interrupted. The mixture is allowed to stand until a sample withdrawn is soluble in acetone that contains from 3-10% of water. The transformation takes some time. The viscosity of the solution becomes lower, but there is no breaking down of the cellulose molecule, and the products retain their strength.

*There will be 34 more patents in this review.*

# Injection Molding Press and Process

Fundamentals of this method of molding are disclosed in the Buchholz patent, filed in 1923

SO much has been said about injection molding, and yet so little about its actual details of operation, that it comes with somewhat of surprise that now the process is covered by a patent containing claims of considerable breadth. In other words, just about the time that the injection molding of cellulosic materials, particularly cellulose acetate, is being adopted, this patent issues with claims that, on their face at least, will "tread on" the most generally known process of injection molding. The patent has been pending in the United States Patent Office for almost a full nine years, and that explains at least in part the reasons for the scope of the claims.

As interest in this field is considerable, we believe that a more complete account of what this patent shows will be acceptable to our many readers. The equipment is somewhat involved. In order to present the inventor's thoughts as originally intended, illustrations from the patent are reproduced with the inventor's own explanatory text.

The invention relates to a method and means for producing molded articles of a variety of shapes and sizes.

**"The process which comprises heating the material to be molded until the same acquires flowing characteristics, then forcing said material directly from the point of heating through a relatively restricted passage under pressure to increase its flowing characteristics and in this condition forcing it into the mold and cooling the mold during the introduction thereto of the fluid material".**

This claim (1) of U. S. P. 1,810,126 of Hermann Buchholz, of Berlin, Germany, whose American rights have been assigned to W. D. Grote, sums up the whole story.

Similar articles have previously been fabricated, principally from phenolic compounds and rubber. However, these articles necessarily were produced in a difficult and expensive manner and the resultant product found to be less satisfactory than articles fabricated in accordance with my invention. Articles made from phenolic condensation products require in the molding operation a gradual hardening in a hot press using preferably sodium hydroxide as a condensing agent and ammonia as a hardening agent. This time consuming chemical treating and physical curing necessitates the employ of multiple cavity molds with their concomitant increased production cost and also precludes any possible reuse of waste material, some of which is always present after the molding operation. Vulcanized rubber also requires curing and the articles must be produced in a hot mold gradually and any particles of waste material thrown away unless the material is again refined.

The principal object of the invention is to produce these articles in an entirely new and improved way employing ma-

terial requiring no curing or treating and capable of being heated to a moldable condition, squirted into the mold while in this condition and then removed immediately therefrom in the form of a finished solidified product. Such material as disclosed in Patent No. 1,568,955 or any acetyl cellulose compound or material having similar properties may be used.

## The Molding Press

Another object of the invention is to provide a machine for carrying out this new method which permits a separation of the material in the mold supplying nozzle just outside the mold. This is accomplished by placing the tapered end of the nozzle in contact with the chilled mold and after separation reheating the nozzle insuring plasticity of the molding material.

A machine illustrative of the invention is shown in the accompanying illustrations in which Fig. 1 is a front elevation of the machine, Fig. 2 is a sectional elevation taken on the line 2—2 of Fig. 1. Figs. 3 and 4 are sectional views showing the mold and associated parts in two positions. Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 4. Fig. 6 is a horizontal plan taken on the line 6—6 of Fig. 4. Fig. 7 is a section taken on the line 7—7 of Fig. 4. Fig. 8 is a perspective view of the finished molded article. Fig. 9 is an enlarged detail of the pressure plunger. Fig. 10 illustrates a mold suitable for the production of a molded article of different shape than that which is made the basis of the illustrations of Figs. 1 to 9.

The machine comprises a suitable support 1. Associated with the support 1 is the foot lever 2 which through link 3 and arm 4 controls the movement of the feeding device 5. On the support 1 is also mounted the lever 6 which operates the ejector plunger 7.

### Molding Technique

Carried by the support 1 is a bed plate 8 which supports the mold proper 9. Three upright bars 10 support the head 11. The head 11 is provided with interior screw-threads adapted to co-act with the screw-threads on the stem 12 which is operated by the hand-wheel 13 and controls the up and down movement of the pressure plunger 14. The feeding device 5 comprises a hopper portion 15, through which the material to be molded is introduced into the feeding device 5. The said feeding device 5 is supported by the plate 16 under continuous downward pressure of the springs 17. Intermediate between the plate 16 and the mold 9 is a plate 18 which may be termed a cold plate, cooled through 20, and which is under continuous downward pressure with reference to plate 16 by means of the springs 19. The feeding device 5 is heated preferably electrically as indicated by the terminals 21 of Fig. 2.

From the foregoing general description, particularly appropriate to Figs. 1 and 2 it will be observed that the material to be molded, after being introduced into the hopper 15, is heated in the feeding device 5 by the electric current in a heating element such as the winding 21 until it becomes plastic and soft. The hand-wheel 13 is then rotated and the pressure plunger 14 forced through the hopper 15 into the feeding device 5, said plunger operating to extrude or squirt from the feeding device 5 the requisite amount of fluid molding material into the mold 9 until the same is filled. As soon as said mold is properly filled, the pressure plunger is elevated and thereupon the foot lever 2 is actuated with the result that the feeding device 5 is forced upwardly away from the mold, the plate 18 also rising from the mold as the plate 16 contacts with the pins 22. The mold is thus isolated and can be opened. After it has been opened, the lever 6 is operated to force the finished molded article upwardly to eject the finished molded article from the mold. The foregoing is the general operation of the machine.

Referring next to details of constructions and particularly

to Figs 3 and 4, x represents the space in the mold to be filled by the molding material in Fig. 3 and the finished molded article in Fig. 4. Above the space x in Fig. 3 is the mold mouth or spout 23. With this spout the discharge orifice of the feeding device 5 is brought into direct connection as shown in Fig. 3, this being the normal position of the machine. The interior of the feeding device consists of the chamber 24 having the sloping walls 25 and the contracted discharge duct 26. In the chamber 24 the material to be molded becomes soft and fluid under the influence of the heating coils 21. As the plunger 14 descends through the chamber 24 it forces a proper amount of the molding material through the duct 26 into the chamber x of the mold 9.

### Ejection Mechanism

In Fig. 3 the plunger 14 is shown as having partially completed its full stroke, and in Fig. 4 the parts are shown in the position they occupy when the molded article has been ejected from the mold by the ejector plunger 7.

The ejector plunger 7 may be of any suitable construction and in the present instance is made with a hollow head 27 in which the block 28 is located. The lat-

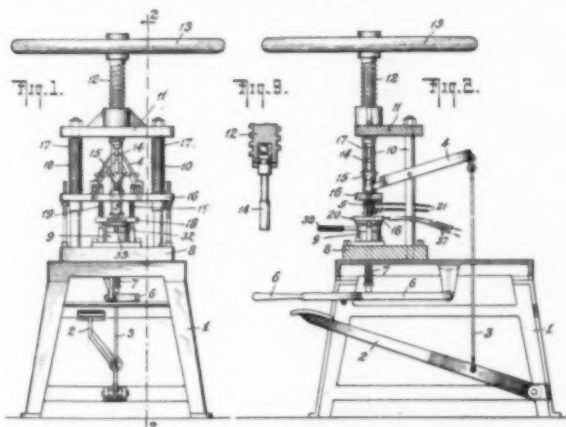
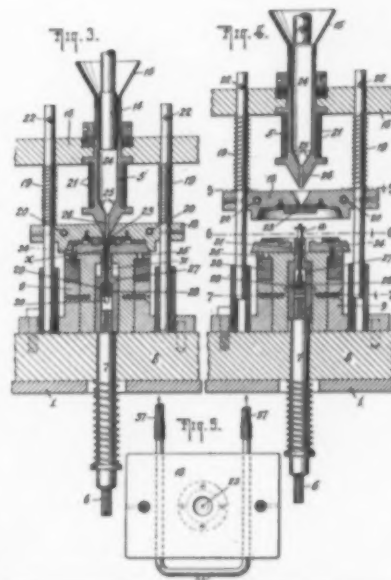
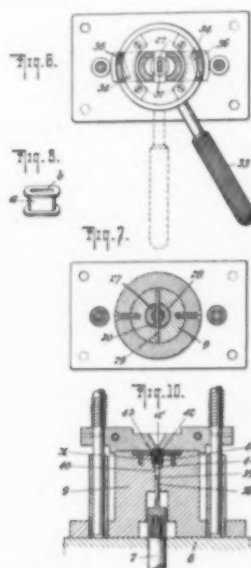


Figure 1 is a front elevation, Figure 2 is a sectional elevation of the Buchholz injection molding press. Figure 9 is an enlarged detail of the pressure plunger.

Figures 6 and 7 are sectional views of the mold. Figure 8 is a perspective view of the finished article molded by this process. Figure 10 shows a mold suitable for producing another article, of different shape than Figure 8.

Figures 3 and 4 are sectional views showing the mold and associated parts all set up for production. Figure 5 is a horizontal of line 5-5 in Figure 4.





ter is stationary with respect to the plunger 7 and is maintained in a fixed position, for instance, by means of one or more pins 29 which pass through slots 30 in said plunger 7. The latter is thus capable of vertical sliding movements relatively to the block 28. A core-forming stem 31 is carried by the block 28 and projects lengthwise of a correspondingly formed passage in the operative end of the plunger 7 as shown in Figs. 3 and 4. In the position of the parts shown in Fig. 3, the core-forming stem 31 projects beyond the plunger 7 into the mold and serves to provide the molded article *a* with a central rectangular core *b* as shown in Fig. 8. As the ejector plunger 7 is lifted to eject the molded article as shown in Fig. 4, the stem 31, by reason of its connection with the fixed block 28, remains stationary, so that the molded article *a* is pushed therefrom as also shown in Fig. 4. It will be understood that the physical characteristics of the stem 31 and its presence in or absence from the molding machine depends entirely upon the character of the article being molded. That is to say, if said article *a* does not include a core, then the machine in question will likewise not include a stem 31; if, on the other hand, the article *a* includes a core of other than rectangular shape, the stem 31 will be correspondingly formed to produce the desired results.

#### Method of Ejection

As previously stated herein, the mold 9 is capable of being opened at the proper time to facilitate the ejection of the molded article *a*, it being understood that this opening operation may be performed in any suitable manner. In the illustrated example, the means whereby the mold 9 is opened comprises a ring 32 rotatably mounted upon the mold support as shown in Figs. 3 and 4, a handle 33 extending radially outward from said ring 32 to facilitate its operation. The ring is

provided with pins 34 which extend upwardly through suitable slots 35 in the mold supports and into slots 36 in the sections of the mold 9; the slots 36 as shown in Fig 6 extending at inclinations which intersect the rotative paths of the pins 34. Thus, as the handle 33 is moved from the dotted line position in Fig. 6 to the solid line position therein, the mold sections will be moved to the open position shown in Fig. 4, by reason of the fact that the co-operative action of the pins 34 of the slots 36 will be such as

to cam the mold sections away from each other. Likewise, if the handle 33 is moved in the opposite direction back to the dotted line position in Fig. 6, the mold sections will be closed and brought to the position illustrated in Fig. 3.

The means whereby the plate 18, which hereinbefore has been termed a cold plate, is cooled may, as shown in Fig. 5, comprise a tube passing through said plate 18 and having its opposite ends connected by means of rubber tubing 37 or the like

(Continued on page 32)

## Forty Companies Exhibit at First Japanese All-Plastics Exposition

By R. Sekido, Publisher, Nippon Celluloid Jihosha

**S**YNTHETIC plastics held the limelight recently in Japan when an exhibition of materials and finished articles was sponsored in Osaka by the Municipal Scientific Research Institute. The exhibition opened on November 1st and was held for two weeks during which time it was very well attended. Forty companies showed their products.

In general, phenolic plastics predominated. In this class, suppliers of raw materials numbered thirteen, including manufacturers of fillers, coloring materials and chemicals. Manufacturers of electrical parts and

tool accessories totaled ten. Three molders of rayon spinning pots and bobbins exhibited and six firms showed phenolic resinoid molded dishes and boxes.

Exhibits of other plastic materials and products were relatively few. There was only one single booth devoted to casein and cellulose acetate plastics. Urea-formaldehyde products were represented by three firms, two materials suppliers and one molder of tableware. The exposition was unique in that it was the first exclusively devoted to the display of these new products.

#### Japanese Plastic Notes

**A**LTHOUGH there are no Japanese government trade statistics on the value of synthetic resinoid products made during the past year, reliable sources of information agree that this figure totals about 7,000,000 Yen, divided approximately as follows:—

Electrical parts . . .	5,000,000 Yen
Rayon industry accessories . . . . .	500,000 "
Decorative Articles . . . . .	500,000 "
Others, including varnishes . . . . .	1,000,000 "

**T**HE Dai Nippon Celluloid Co., Ltd., Osaka, has entered

the synthetic resinoid field with Carboloid, phenolic, and Marboloid, urea formaldehyde resins. This company, long a force in the pyroxlin field, is also the only casein plastic producer in the Orient, marketing this product under the trade name, Lactoloid. Two foreign materials were introduced by large firms at the Plastics Exhibition at Osaka. Otomune Co., Ltd., of Osaka entered the field as sole sales agents for the American General Plastics, Inc., product Durez and Miki Co., Ltd., of Osaka presented Polloplas to the local trade. There is a definite trend in Japan toward modern color effects.

PLASTICS & MOLDED PRODUCTS



# Plastic Sheet Stock Improves the Manufacture of Artificial Limbs

Lumarith Supplements New Metal Drawing Process Developed by C. H. Davies

**N**EW uses for plastic materials have in recent years been coming along in such rapid succession that one more innovation may not exactly constitute front-page news. But occasionally the routine performance of industrial products takes a side dip into human affairs, in such a manner as to produce news of the distinctly "human interest" type. Of such is the part played by a plastic material in the manufacture of artificial limbs.

The art of making artificial human appendages to replace those lost by accident, disease or modern high-explosive warfare has progressed considerably since the days of "peg-legs." Hardly anyone today does not know someone who has an artificial limb that serves its wearer almost as well as the member it replaces. The wearer walks naturally, is fairly agile and in many ways gives no hint of the fact that he is wearing an artificial limb. In fact, so far has manufacture of these articles gone forward that even the vanity of the wearer has been considered. Unless closely examined, many artificial limbs today actually look like human flesh.

## The Wooden Limb Passes

The part which Lumarith, the cellulose acetate molding material, plays in this picture is aptly told in a recent article in the *AMERICAN MACHINIST* about the manufacture of artificial limbs from seamless aluminum alloy tubing by the Penn Capital City Limb Co., of Philadelphia. The development of the all-metal arti-

ficial limb was in a measure a revolt against the old conventional wooden one. The wooden limb was annoying in many ways to the wearer: It was usually fashioned by hand of leather, wood and steel, was clumsy and heavy, and, since formed by hand to the stump, never fitted perfectly. The aluminum alloy artificial limb originated by Mr. Charles H. Davies and manufactured mechanically is light, is shapely, has ball-bearing joints and altogether gives the wearer great freedom and almost natural action.

## Finishing the Metal Limb

In the development of the aluminum alloy artificial limb, it was found that it had several undesirable features. These were its metallic "feel", its tendency towards vibration and consequent undesirable noise, the possibility of its being dented, its lack of resistance to corrosion from perspiration, and, last but not least, its metallic, unnatural-looking finish. Various lacquers and varnishes were tried in an effort to secure a flesh color, without much success.

"Finally," continues the article, "plastics were resorted to, but many of these were inflam-

mable, hence highly undesirable—for the person with an artificial limb has no way of telling when it is too close to an open fire. Lumarith, a cellulose acetate molding material that is non-inflammable and easily formed, was tried. It was found that Lumarith tubing of flesh color—in fact of any flesh color desired, pink, white, red, yellow, or black—could be fitted uniformly and tightly over the metal form with a minimum of labor, and that it answered all the objections to the metal limb. It took out the ring, gave a proper color and feel, supplied

(Continued on page 33)



The new seamless, metal limb is a notable improvement over older forms. The Lumarith-covered shin absorbs sound, eliminates vibration, prevents dents, will not chip or crack, is waterproof and can be cleaned. Sheeting can be applied in fifteen minutes as against four hours required for enameling.

Photo Courtesy of Penn Capital City Limb Co.

# Recent Activity In the Synthetic Resin Field

## A Short Review of Contemporaneous Patents

By Carl Marx

Editor, *Plastics & Molded Products*

THE past four months have brought to light quite a number of interesting processes in the domain of artificial resins. Most of them relate to work that has been done quite some time ago, but which only now becomes public by the issuance of the patents, which, in some instances, have been pending for as long as ten years. It will be obvious to those familiar with patent claims, that in such cases very often a patent will issue after others have considerably advanced the art, in ignorance of the fact that there would be forthcoming, and live for seventeen years, a patent that would completely dominate what they were doing, and to the owner of which they would either have to pay tribute, or quit.

The uninitiated are often very much astounded at this, but it is perfectly proper and legal, and one of the unavoidable concomitants of our patent system, which makes patent appli-

cations absolutely secret until they have matured into patents. In this respect our system is different from that of almost all other countries, where patents either are made public in application form after a given short period, or else date from the day of application, so that the owners thereof are compelled by self interest to have them issued as soon as possible. On the other hand, in our country, there is a positive advantage in letting patent applications lie dormant in the Patent Office, for the patents date from day of issue. In all justice, it should be pointed out, however, that in many cases these long delays are entirely unavoidable, and are due to interferences between applications of rival inventors for the same invention. These interference proceedings are long and expensive, and may last from one to five years or more. It is therefore with considerable interest that workers and manufacturers in this field scrutinize the claims of patents that have an early filing date.

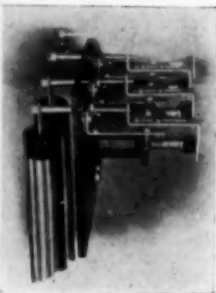
With this introduction let us

look at what has recently been published along this line.

There is, for example, the U. S. P. 1,811,808; granted June 23, 1931 to L. V. Redman, A. J. Weith and F. P. Brock on an application filed over ten years ago, namely May 23, 1921, and assigned to the Bakelite Corporation which contains claims for a process and product which latter comprises a fusible condensation product, a phenolate in minor proportions, and an active methylene body in sufficient quantity to convert the fusible condensation product to the final infusible state. The process is carried out substantially as follows:—

### Procedure

Boil together in a still for two hours, preferably at about 200° C., with continuous rapid stirring, 74 pounds of calcium hydrate ( $\text{Ca}(\text{OH})_2$ ) and 877 pounds of a mass comprising a phenolic condensation product resin and a free phenolic body, the mass corresponding with approximately 1 and  $\frac{1}{4}$  phenolic groups to each methylene group; then cool the mass; then coarse-break the mass and grind it; then mix with the comminuted material enough hexamethylenetetramine to convert the fusible condensation product to an infusible condition, which in this case amounts to about  $52\frac{1}{2}$  pounds of hexamethylenetetramine, that is, six per cent of the condensation product and free phenolic body; then pulverize the mixture in a beater-mill to about 200 mesh; then blend the mixture in a stirring mill; and finally mix the mixture thus obtained with a suitable filler, preferably a fibrous filler. This



Many Bakelite resinoid parts are used in the construction of these harmonious chimes. The chimes are electrically controlled and operated. The tubes are of bell metal, and in the top of each is a Bakelite molded plug, which gives a clear, sweet tone, from which the device takes its name, "Velvaton". Other Bakelite parts are: end pieces on solenoids; mounting plate, and control unit parts.

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## EASTMAN CELLULOSE ACETATE

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Chemical Sales Department

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operation may be performed in a ball-mill, or in a tumbling-mill. It will be found that by this method asbestos may be quite uniformly incorporated in the mass, without destroying the fiber of the asbestos. Wood flour, cotton flock, or other filler may be introduced in the same way.

The product thus obtained may be successfully molded in a hot press more advantageously than has hitherto been possible.

There are twenty-one claims, all of fairly broad scope.

#### Divinyl Acetylene Resin

Along an entirely different line is a series of condensation products, ranging from an oil to a brittle resin, described by J. A. Nieuwland in his U. S. P. 1,812,541; patented June 30, 1931 on an application filed in 1929, and assigned to E. I. Du Pont de Nemours & Co. This consists of a polymerization product of divinyl acetylene. The latter is a low-boiling oil (B. P. 80-85°C.) which is obtained by passing acetylene into a mixture of ammonium chloride, water, cuprous chloride and copper powder. It is isomeric with benzene and acetylene, having a formula which may be anything from  $C_4H_4$  to  $C_6H_6$ . Its constitution is however quite different, for it will readily polymerize into oily, and finally resin-

ous condensation products. A few examples will illustrate this invention.

#### Example 1

Place 25 cc. of a mixture of unsaturated hydrocarbons obtained from acetylene as described and containing divinyl-acetylene in a pyrex glass tube, leaving 50 cc. of air space over the liquid, seal the tube and immerse it in a boiling water bath for 24 hours. A hard cake of resin results which is insoluble in acetone and the usual organic solvents.

#### Example 2

Heat 250 cc. of the mixture of unsaturated hydrocarbons obtained from acetylene under a reflux condenser to 85°-87° C. for 16 hours using a water bath. A stiff gel is obtained which is slightly soluble in acetone but substantially insoluble in alcohol.

#### Example 3

Heat 250 cc. of a mixture of unsaturated hydrocarbons obtained from acetylene as described and containing divinyl-acetylene under a reflux condenser to 85°-87° C. for three hours, using a water bath. Remove the unchanged hydrocarbons by distillation in vacuo. A viscous or gelatinous product results which is almost completely soluble in acetone but only partly soluble in alcohol and which consists of a mixture of the alcohol soluble and acetone soluble modifications which may be separated by extraction.

The high-boiling tar acids derived from processes of making a fuel gas form the raw material

from which Stephen P. Burke makes a series of synthetic resins of the phenol-formaldehyde type. As disclosed in his patent issued July 14, 1931, U. S. P. 1,814,124, filed Sept. 11, 1924, and assigned to the Combustion Utilities Corporation, these tar acids will combine with aldehydes to produce valuable synthetic resins. For instance a typical resin of the series forming the subject of the present invention can be prepared by mixing one volume of commercial forty per cent formaldehyde solution with three volumes of the oil containing the high boiling primary tar-acids just described. To this mixture is added two to ten per cent by weight of sodium carbonate solution and the whole is heated in an autoclave or in an open vessel equipped with a reflux condenser to a temperature of 120° to 185° C. Heating, with or without pressure is continued until there remains only a small proportion of the primary tar-acids in the oil. The residual mixture is then allowed to separate into layers, and on cooling the bottom layer forms a semi-solid mass which is fusible, and at least partially soluble in benzene, alcohol, ether, acetone, acetic acid and other like solvents, and can be used for making lacquers, varnishes, enamels and polishes.

#### Transforming the Resin

To transform this fusible-soluble resin into an insoluble and infusible type, it is heated at elevated temperatures in a closed vessel under pressure, or it may be further treated with formaldehyde or its equivalent, with heat. The infusible and insoluble resin thus produced is tough and possesses a high degree of elasticity, whereas the ordinary Bakelite C is hard and brittle. Before beginning this final heat treatment, the soluble-fusible intermediate resins may be compounded with various filling materials, such as wood flour or asbestos, in order

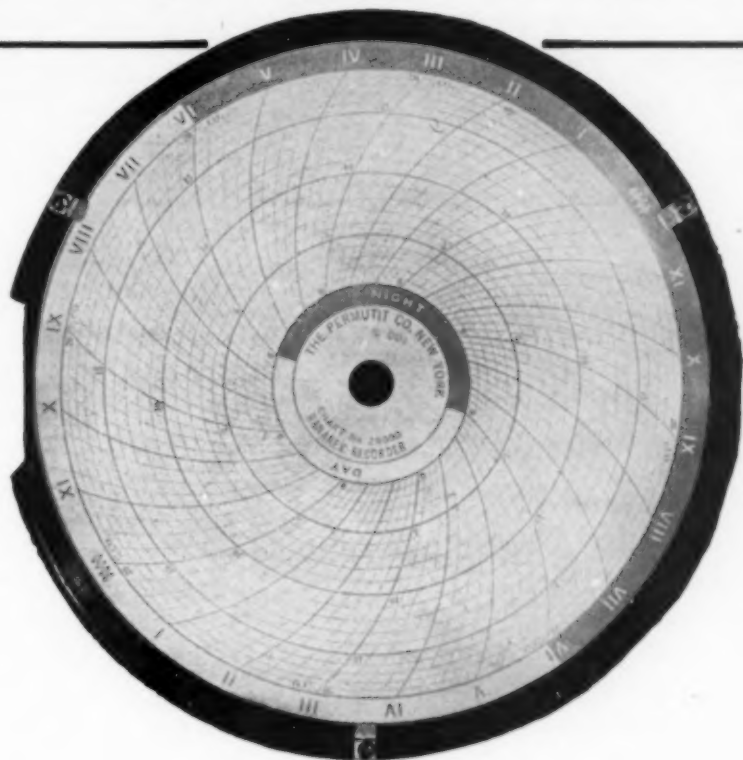
(Continued on page 40)



Two interesting Durez resinoid molded applications. Dag, an all-purpose chloride deodorant and antiseptic, has a walnut combination measuring cup and closure. Johnson & Johnson merchandise Couettes in a black Durez molded package—Very tastefully designed, ornamented with silver, the Couette box makes an attractive dressing table accessory.



FOR SPEED AND ECONOMY in making or assembling molded, cast and laminated plastic products INVESTIGATE SELF-TAPPING SCREWS



#### Typical Applications



Metal screen fastened to Bakelite Molded goggles with Hardened Metallic Drive Screws.



Cover fastened to molded Durez clock case with Hardened Self-tapping Screws.

## Self-tapping Screws Saved 50% of Labor in fastening clips to thin molded Bakelite

### Free Samples

Coupon below brings free samples for trial. If you attach a \* description of one or more fastenings, our Assembly Engineers will report whether you can use the Screws to advantage. \*Tell us—1. How fastening is now made. 2. Thickness of part to be fastened. 3. Thickness of material in which screw is to engage. 4. Kind of material. A blue print and sample of the part would assist our engineers in making helpful recommendations.

Shown above is a thin Bakelite Molded cover used on The Permutit Company's Ranarex Recorder. By using Hardened Self-tapping Sheet Metal Screws in place of machine screws for fastening the three metal chart clips to the cover, the Permutit Company saves 50 per cent of the labor formerly required. Tapping operations have been eliminated, and the production route has been considerably shortened. Permutit reports—"We are so pleased with these Screws that we plan to use them in assembling

other parts of the Ranarex Recorder."

In both the molding and assembly of plastic products, Hardened Self-tapping Screws should have careful consideration. Very often these Screws can be used in place of molded inserts, machine screws and rivets to simplify design, speed-up production and materially reduce molding and assembly costs. Tests prove that Self-tapping Screws make better fastening than machine screws in tapped holes, machine screws and nuts.

#### Type "Z" Hardened Self-tapping Screws



For joining and making fastenings to molded, cast and laminated plastics; aluminum and die castings, sheet metal. Turn Screw into drilled or molded hole. Can be removed and replaced without impairing the holding power.

#### Type "U" Hardened Metallic Drive Screws



This type of Self-tapping Screw is for making permanent fastenings to molded, cast and laminated plastics; also iron, brass and aluminum castings and steel. Just hammer the Screw into a drilled or molded hole.

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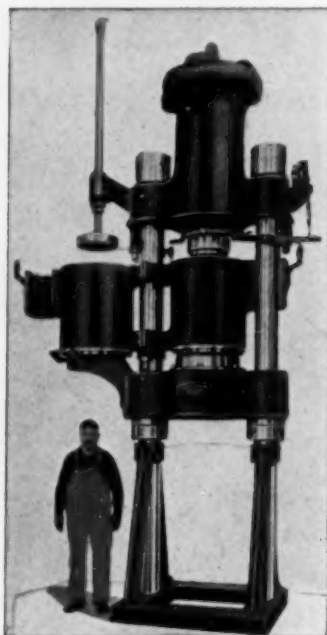
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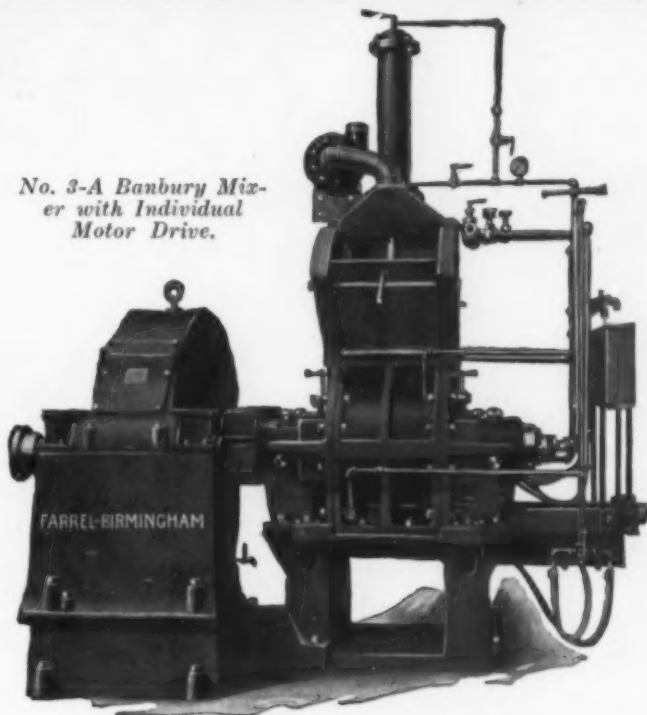
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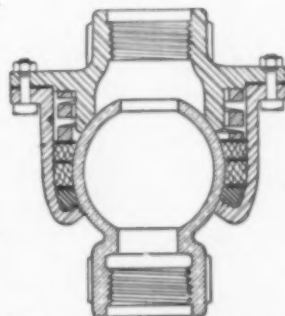
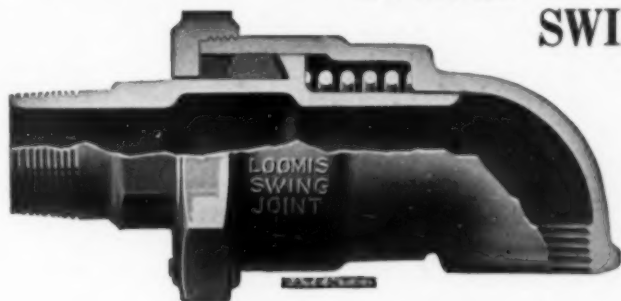
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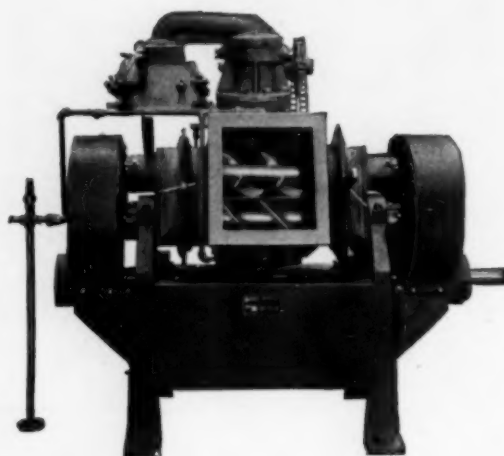


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**"For the want of a nail a shoe was lost,  
For the want of a shoe a horse was lost,  
For the want of a horse . . . the kingdom was lost"**

*Poor Richard's Almanac*



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*If it can be molded we can furnish the Molds.*

# Two New Methods For Affixing Pyroxylin Plastic Sheet Coverings

Patents recently granted apply to flat surfaces, like wallboard, and curved surfaces, like toilet seats

**T**HE increasing vogue of fancy, pyroxylin plastic sheet covered toilet seats and similar articles, such as benches and tables etc., brings with it some difficulties in manufacture. In general the articles consist of a wooden base or a base of a pressed pulp material, that is then covered with softened sheets of pyroxylin plastic. As the sheets dry out by loss of solvent, they contract and tightly adhere to the base, which has usually also been coated with a suitable adhesive. The greatest difficulties have been at the edges where the sheets met. A line of cleavage was almost always visible, and moisture or water would work into this crack, and eventually would cause blistering or complete loosening of the plastic material from its base.

This problem has been solved by Howard P. de Correvont, of Chicago, Ill. In a patent granted for the invention, U. S. P. 1,824,537; Sept. 22, 1931 (assigned to Brunswick-Balke-Collender Co.) he describes it as follows:—

## Pyroxylin-Covered Toilet Seat

The core 1 of the closet seat has a somewhat sharp outer edge which is provided with a recess 2 extending therealong throughout the entire periphery of the seat. A strip of pyroxylin 3 extends along the edge and is received in and fills the recess. The bottom of the seat is flat and is covered with a sheet of pyroxylin 4, and a similar sheet 5 covers the curved top surface of the core and extends down over the strip 3 into abutting relation with the sheet 4.

The core has also a similar edge 6 extending around the opening in the seat and the joint of the pyroxylin sheets at the latter edge is similar to the one just described.

The improved coating is applied as follows: The walls of the recess 2 are coated with an adhesive and the strip 3 is then secured in position and the adhesive is permitted to dry. The sheet 4 is then secured to the bottom of the core by an adhesive, which is permitted to dry, after which the outer edge of the sheet is trimmed off to bring it flush with the outer surface of the strip 3. The sheet 5 is then secured to the upper surface of the core by an adhesive and is brought down so as to abut against and extend beyond the sheet 4, after which it is trimmed off so as to be flush with the surface of the latter sheet.

Pyroxylin coatings for articles are usually quite thin and have heretofore been of such character as to readily break and wear away at sharp edges. The substantial thickness of the reinforcing strip 3 in the improved joint eliminates this weakness and provides an especially strong and durable construction. The sheets 4 and 5, being of substantially uniform thickness, have no weakened portions such as would result from feathering, as has been done heretofore in making joints for pyroxylin sheets. Again, the pyroxylin sheets are not bent angularly in such a manner as would cause danger of cracking, and thus a defect of prior constructions has been obviated.

Although the walls of the recess 2 have been shown as disposed angularly with respect to each other, it is not necessary that they have this shape, as the wall may be curved or have other forms if desired.

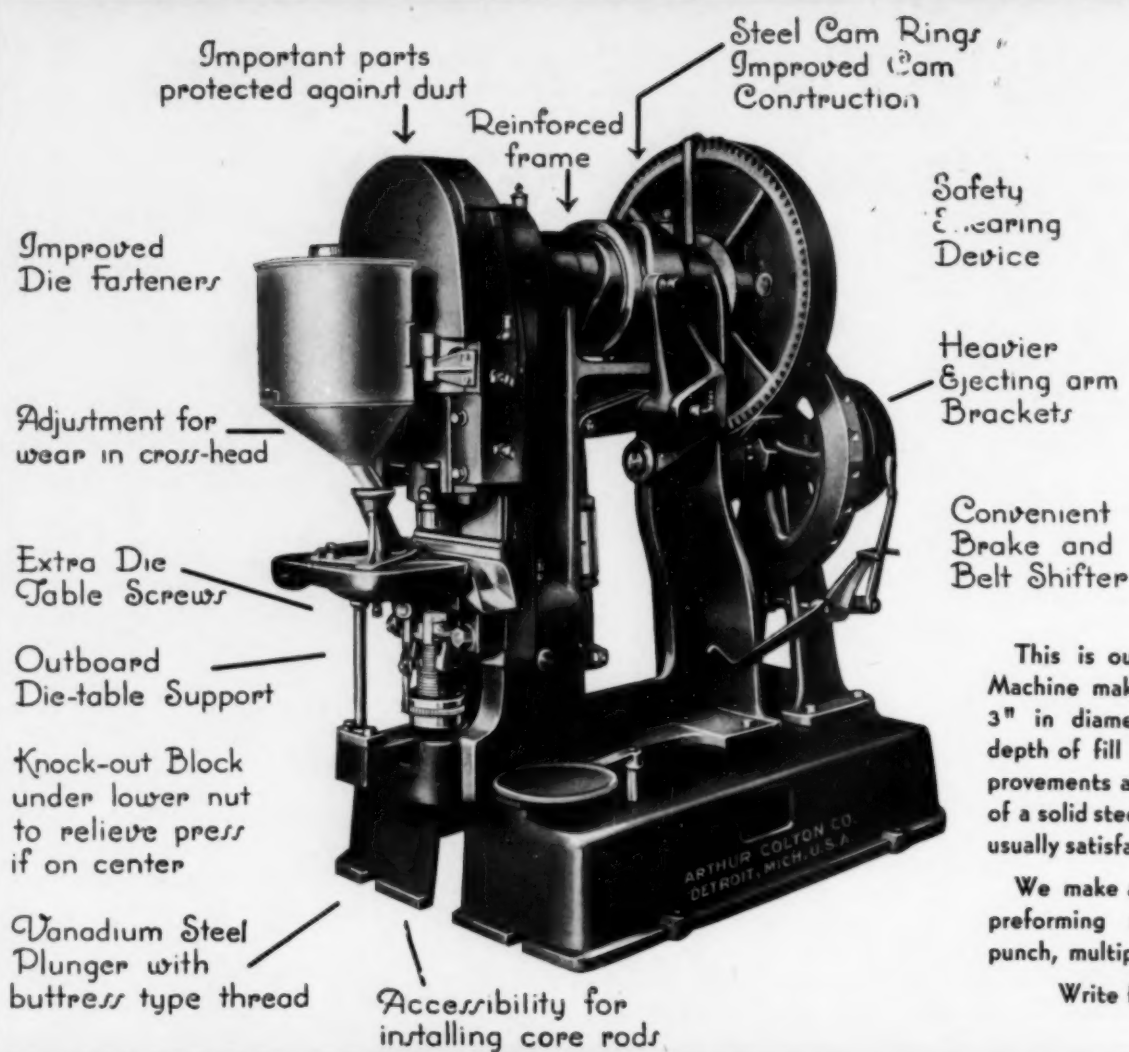
## Resinoid-Bonded Coverings

**T**HE manufacture of ornamental panels by means of thin sheets of a cellulose ester plastic, such as cellulose acetate or nitrate has been carried out for some years. An important consideration however is the appearance of the finished product. When the sheets are relatively thin or of a translucent material, the background has a tendency to show through the plastic.

W. H. Moss prevents this by the comparatively simple expedient of employing a synthetic resin, such as one made from phenol and formaldehyde to secure a layer of a cellulose ester plastic powder to a composition board; upon which foundation he then applies a sheet of cellulose ester plastic. U. S. P. 1,815,444; July 21, 1931 has issued on the invention and is assigned to the Celanese Corporation of America. In this patent there are several disclosures as to the manufacture of plastic powders from a cellulose acetate base. The objects of the invention include the production of wall board having a highly ornamental surface. It is obvious that this would be quite a good outlet for plastic sheet stock and hence the invention is of immediate interest.

(Continued on page 35)

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## Dr. W. S. Landis Heads New York Section A. C. S. for 1932

**D**R. Walter S. Landis, vice-president of the American Cyanamid Company, has been elected chairman of the New York section of the American Chemical Society for 1932, it was announced recently at a meeting of the organization in the Museum of Science and Industry, 220 East Forty-second Street. He succeeds Professor Arthur E. Hill of New York University.

Dr. Landis, vice-chairman of the section last year, was a professor in Lehigh University from 1907 until 1912, when he became chief technologist of the American Cyanamid Company. In 1921 he was named vice-president of the company. He is a past president of the American Institute of Mining and Metallurgical Engineers.



Photo Blank & Stoller, Inc.

At the same time, Dr. J. G. Davidson of the Carbide and Carbon Chemical Corp. was named to the executive committee and Mr. Leon V. Quigley, Bakelite Corp., was elected a councillor.

## French Court Renders Verdict for Paisseau in Pearl Essence Patent Appeal

**M**ANUFACTURERS and users of pearl essence in plastics and lacquers are undoubtedly interested in the final outcome of the Paisseau-Jacobson patent litigation in the French courts. Mr. D. W. Leys, of Paispearl Products, Inc., New York City, has translated for *Plastics & Molded Products*, the summary of the decision of the Court of Appeals, Paris, Fourth Chamber, dated June 16, 1931, in the matter of Paisseau vs Jacobson.

The Court's considerations were: adjudicating the appeal brought by Paisseau from a judgment of the Tribunal Civil de Pontoise dated November 6, 1929, holding invalid patent No. 543,504 taken out by him November 12, 1921; dismissing his claim of infringement against Jacobson and ordering him to pay 50,000 francs by way of profits and damages; and also adjudicating the appeal of Jacobson;

Following a lengthy opinion, the decision of the court is summed up as follows:

The Court sustains the appeal of Paisseau, affirms the judgment of the lower court in dismissing the defense of invalidity for insufficient description;

Reverses it as to the rest;

Holds that the filing in France the 9th of October of an application which is withdrawn before being communicated to the public does not constitute the filing in due form contemplated in Article 4 of the Convention of the Union;

Holds moreover that Paisseau's position is well taken in invoking for the protection of his French patent No. 543,504 the right of priority resulting from the German patent of the 26th of February, 1921.

Therefore declares the French patent of November 19, 1921 to be valid;

Dismisses the appeal of Jacobson and all his requests, arguments and conclusions;

Holds that he infringes patent No. 543,504.

Therefore condemns him to pay damages to be fixed by an accounting and in the meantime to pay 100,000 francs;

Orders him to pay for the publication of this decree in five newspapers to be chosen by Paisseau, each publication to cost more than 1,000 francs. Holds that there is no ground for imposing a fine;

Orders him to pay all the cost of the suit in the lower court and the appeal.

## New Industrial and Business Research Group is Formed

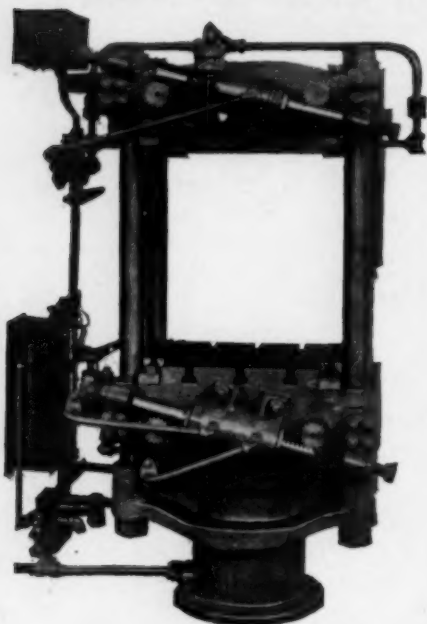
**A** new type of service organization, to facilitate the marketing of industrial products, has been formed by Dr. H. H. Sheldon, H. A. Morse, L. W. Hutchins, and Dr. W. H. Easton, all well known in many branches of industry, engineering and science. The company, with offices at 191 West 10th Street, New York City, will be known as Sheldon, Morse, Hutchins & Easton.

This group will give special attention to the economic problems arising in connection with scientific research by assisting manufacturers to determine the applications and markets for products in the laboratory or development stages, estimate the amount of research expenditures that are economically justified, make surveys of competition and patents, and plan supplementary research work and the development of new products to meet market conditions.

The company also plans to furnish manufacturers with a complete sales research, advertising, and publicity service, based on the principals' experience in the promotion and sales of chemicals, electrical equipment, building materials, industrial and marine supplies and machinery, scientific apparatus and other lines.

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Dr. Sheldon is the chairman of the Physics Department, Washington Square College, New York University, research scientist and engineer, consulting science editor of the New York Herald-Tribune, and author of numerous scientific works.

Mr. Morse is president of H. A. Morse, Inc., industrial advertising and marketing counsel, and was formerly managing editor of "Building Age and National Builder."

Mr. Hutchins is Director of Public Relations for the Swann chemical companies, and he is director of The American Institute and treasurer of the Junior Institute of Arts and Sciences.

Dr. Easton was for many years with the advertising department of the Westinghouse Electric & Manufacturing Company, as an executive on advertising, sales promotion, and national publicity, and is past president of the Technical Publicity Association of New York City.

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Empire State Bldg., 350 Fifth Avenue, New York, N. Y.

### Injection Molding

(Continued from page 20)

with a source of cooling medium such as cold water, which, by circulating through tube 20, serves to abstract heat from the plate 18.

It will, of course, be understood, that the machine, instead of being manually operated in the manner herein described, may be automatically operated in all of its parts by suitable mechanism. It will further be understood that the mold 9 may be duplicated to any extent in the machine, so that successive molds may be brought into proper operative relation with the forming means and the machine thus operate in progressive steps to increase the speed of operation and output; similarly the machine may include a plurality of molds and a plurality of co-operating devices such as herein shown in order to co-incidentally produce a plurality of articles.

PLASTICS & MOLDED PRODUCTS

The machine is particularly adapted for the use of a molding material having the characteristics of a non-inflammable organic material, such for example, as a material the base or main constituent of which is acetyl cellulose which softens and fluidifies at temperatures between 80° C. and 120° C.

#### Lumarith for Artificial Limbs

(Continued from page 21)

necessary outside corrosion resistance, and in addition about doubled the resistance of the material to denting. Lumarith tubing of a diameter approximately that of the ankle is now dipped in hot water, expanded to a truncated cone, the limb section slipped in, the top edge of the plastic turned over, and the assembly allowed to cool. The Lumarith shrinks tightly in place and provides a permanent outer finish. The limb is then drilled with a number of small holes for ventilation, the inside of the tubing is sprayed with a corrosion-resisting paint, the socket and foot are fitted, and the leg is complete.

"Since Lumarith worked so well as an outer covering, it was reasoned that it should work equally well for the socket. The sockets were formerly hand formed of wood or leather, and were of course good or bad fits, depending upon the state of the artisan's disposition on a particular day. Suffice it to say that few fitted perfectly. By the new process, however, a mold is made of the stump, a cast made in the mold, Lumarith shrunk over this cast, the cast cut out, and the socket, complete, corrosion-resistant, and a perfect fit, placed in the top of the limb. Further, at a later time when the stump shrinks with natural shrinkage of the muscles, the same process is simply repeated, the old Lumarith socket being reshunk to the new cast. This avoids the former necessity of an entirely new fitting of the stump, loss of time, cost, and the other attendant difficulties."

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uses STOKES Single Punch and Rotary Preform Presses



\* Installation view of STOKES Single-punch and Rotary Preforming Presses in Bryant Electric Company's plant, Bridgeport, Conn. Other installation views have appeared and will follow in other advertisements.

Leading molders insure uninterrupted production in their preforming departments by using STOKES Preform Presses with Excess Pressure Release, a feature of all STOKES single-punch and rotary models.

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INCLUDE:**

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# Two New Methods for Affixing Pyroxylin Plastic Sheet Coverings

(Continued from page 29)

In applying the adhesive coating composition, the same may be applied by brushing, spraying or flowing the same only onto one surface or onto both surfaces to be united. If it is applied to only one surface, it is usually applied to the more receptive or more porous surface.

The adhesive coating composition 2 is applied liberally to the surface of the composition board 1, and the volatile solvent then allowed to evaporate until a tacky coat is formed. Thereupon a powder 3 containing finely divided and intimately mixed organic derivative of cellulose and plastifier is sprinkled on this tacky coat to form a thin layer, and a further drying of the tacky layer is permitted. A plastic sheet or film 4 containing cellulose acetate is then placed upon the surface of the adhesive coated composition board, and the same pressed at elevated temperatures for a suitable time. It may be stated that a pressure of 800 lbs, per square inch, a temperature corresponding to a steam pressure of 10 lbs. per square inch and a time of pressing of 15 minutes have been found satisfactory. However, more or less pressures and temperatures may be employed, and in some cases ordinary hand pressure and ordinary temperature produce useful results.

## Adhesives Used

When plastic sheets or films containing derivatives of cellulose are to be caused to adhere to surfaces, it is preferable to employ the same derivative of cellulose in making the adhesive as occurs in the plastic sheet or film. Thus if a sheet containing cellulose acetate is to be caused to adhere, both the adhesive coating composition and the powder preferably contain cellulose acetate, while if the sheet contains cellulose nitrate, the

adhesive coating composition and the powder should contain cellulose nitrate. Also if the plastic sheet contains resins, the same resins are preferably employed in either the liquid adhesive composition or the powder or both.

## Example 1

As an example of a suitable liquid adhesive coating composition that may be used in the first step of the process, the following is given:

	Parts By Weight
Cellulose acetate	1 to 9
A compatible synthetic resin	9 to 1

Diethyl phthlate	2 to 10
Acetone	50
Benzene	25
Alcohol	25
Ethyl lactate	10

The compatible synthetic resin for this example may be a phenol formaldehyde resin, a diphenylol propane-formaldehyde resin, a diphenylol propane-acetone resin, a diphenylol propane-acetone-formaldehyde resin, a furfural aniline resin, a phenol furfural resin or the resin prepared by heating lactic acid.

## Trade Expositions

ALTHOUGH trade shows appear to be accepted as helpful to business, the opinion of exhibitors in many industries is that methods of conducting

# MART

for MOLDED DUREZ PRODUCTS

November, 1931 Issue

Published by  
**GENERAL PLASTICS**  
INCORPORATED  
Manufacturers of  
**DUREZ**  
Molding Compound  
NO. TONAWANDA, N. Y.

A Printed Meeting Ground for the Buyer and Producer of Molded Products

## How and Why

First, an explanation: General Plastics, Inc., makes Durez Molding Compound only. The articles shown here are made by the custom molders to whom we sell the raw material, Durez. We do not molding ourselves. Durez has a host of uses in the electrical, radio, novelty, packaging and similar fields. For instance, the caps on cigarette containers and telephone tubes are molded of Durez. Radio tube bases are another use. It is hard, lustreous, almost unbreakable, stain-resisting, odorless, and comes in a score of colors and myriad small efforts.

Why the "Mart"? Because molders are essentially craftsmen, not salesmen. Prospective buyers of molded articles never know what the molders were doing, and the molders had no way of telling them. So we show their Durez products in the Mart, making it in all possible ways for the various articles. If you'd like prices, samples or other data about any product shown, use the postcards enclosed. There is no obligation, of course.



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MART is the new house organ of General Plastics, Inc., N. Tonawanda, makers of Durez. It is to serve as a printed meeting ground for the buyer and producer of molded products. First issue, November 1931, contains numerous molded Durez applications, keyed so that prospective buyers can readily obtain additional information. MART will be sent by General Plastics, Inc. to all interested parties.

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these shows must be brought into line with today's changed conditions if buyers of space are to be assured of adequate returns, according to a survey just completed by the Policyholders Service Bureau of the Metropolitan Life Insurance Company. The results of this survey have been published in a report entitled "How Exhibitors Are Meeting the Trade Show Problem".

The report describes the control methods that have been adopted in the different industries. Among the more successful practices reported, has been the establishment of exhibitors' committees and boards. The survey indicated that another common method of dealing with the problem is by changing the interval between shows—"replacing two semi-annual shows with one annual show or the annual show with a show every two years". The opinion was expressed however, that there is no ideal schedule—"each industry, apparently, must work out the frequency question for itself".

Executives interested in the subject may obtain copies of "How Exhibitors Are Meeting the Trade Show Problem" by writing the Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Avenue, New York City.

### General Electric Announces a New Gasket Material

**A** NEW gasket material, moisture-proof, and highly oil-resistant, has been announced for sale by the General Electric Company. This material, known as No. 1000 Compound is recommended especially for applications where the primary purpose of the gasket is to exclude moisture, for which purpose it has been found superior to cork or other rubber compounds.

It is a white, odorless, sulphur-free rubber compound, available both in sheets and moulded shapes. It is extremely tough and strong, very flexible, requires no sticker, and can be used repeatedly in testing



work, as well as in permanent joints. It is unaffected by exposure to the weather, and when under compression in properly-made joints is not attacked by cold oil. In contact with hot oil it is practically unaffected where enclosed in recessed joints under compression, but is not generally recommended where resistance to hot oil is of prime importance.

#### West Coast Molders Move

Stringfield and Oedekerck, Los Angeles, Calif. custom molders, announced the removal of their plant to a newly-acquired building on December 10th, at 1702 East 61 Street. Enlarged space and additional equipment is available at the new location.

#### A. S. T. M. 1931 Index

THE American Society for Testing Materials is releasing the 1931 Index to A. S. T. M. Standards and Tentative Standards with the A. S. T. M. December *Bulletin*. This is designed to be of service both to those familiar with A. S. T. M. Standards and those who are not. Its value to the former group is in locating any specification or method of test in the bound Society publication in which it appears. To both groups the Index is a very convenient reference in ascertaining whether or not the Society has issued any standards on a specific subject.

Copies are furnished without charge to those who send request to Society Headquarters, 1315 Spruce St., Philadelphia.

#### Italian Increase of Tariff on Radio Sets

A Decree which was recently published in the Official Gazette imposes new duties on most radio receiving sets above five to six times the former rates and on transmitting equipment about three times. Cabinets and containers for sets are dutiable at the same rates as apparatus. To these new duties must be added 15 per cent ad valorem.

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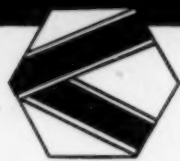
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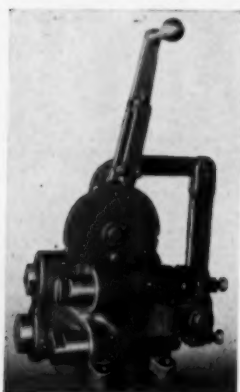
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# British Industry Notes

By A. C. Blackall

British Correspondent

## Erinoid, Ltd., Ends Satisfactory Year

ALEXANDER BINNIE, chairman of Erinoid, Ltd., revealed that the net profits of that company for the year were £12,536 (\$62,608), as compared with £15,000 (\$75,000) for the previous eleven months, when he presided at the sixteenth annual meeting, recently held in London. A sum of £2,467 (\$12,335) has been received from the Erinoid Company of America (now liquidated), and Mr. Binnie declared that when dividend payments had been made there would be ample funds to maintain the firm's credit at the peak which it has attained both in Britain and France. The firm's two French subsidiaries have been sold to the Casein Holding Co., Luxembourg, for £50,000 (\$250,000), which (subject to realization, is expected to show a surplus of

£11,766 (\$58,830). The chairman stated also that he was convinced the coming year would show better results, and that the first months of the company's new financial year have shown a gratifying increase in both sales and profits.

## Auto Firm Starts Molding

THE well-known firm of Bleumel Bros., Ltd., Wols-ton, has announced its entry into the plastics field. For more than 25 years this concern has manufactured celluloid automobile and motorcycle accessories and, as a result of its success in molding parts for its own productions, has decided to embark on general molding work, using synthetic resins as well as cellulose acetate.

## Astrinite, A New Bitumen Molding Compound

THERE has recently been introduced to the world of molding materials a new product known as Astrinite. This is a bitumen plastic the high dielectric qualities of which, together with its acid and fire-resisting properties, make it valuable for purposes where those qualities are of more importance than the brilliant finish of synthetic resin moldings. Astrinite should prove a valuable addition to the plastics industry, particularly as it requires no subsequent baking.

Prior to the introduction of this material, bitumen plastics had only been made by a few concerns for their own specific requirements. However, the

fact that Astrinite has been launched by the General Plastics Corporation, Ltd., Lewisham, London, should be sufficient to make the virtues of bitumen plastic widely known in modern industry. The initial capacity of the corporation's Empire Works is approximately 56 tons per week, but it is hoped to increase this substantially as the demand for the new product makes this necessary.

## Casein Plastic Articles Are Polished by a New Process

IN the production of articles from casein sheets and rods many concerns have made a large number of experiments to do away with the necessity for barrel or hand-polishing of the manufactured articles. Ingenious machines have been design-

ed to do this operation mechanically in the button trade. In the polishing of shaped plastic articles the heat generated in hand polishing often creates a tendency in the casein to lose the desired shape, while barrel-finishing is a lengthy process which removes the sharp edges which may be required.

## Dipping

A new dip polishing solution has been introduced by the Glasgow Chemical Co., Ltd., Glasgow, with the object of overcoming these difficulties, and is being largely used by comb manufacturers and casein button makers. This solution consists essentially of an isomeric form of hypochlorate of soda, and differs in many of its properties from the ordinary hypochlorate and gives a much higher polish. When treated with a catalyst such as sugar, for example, it does not discharge its oxygen until a temperature of 190 degrees F. is reached, while the common hypochlorate discharges at 130 degrees F. One of the difficulties presented by common hypochlorate is that it recedes in strength very rapidly, whereas this new solution (known as "kopen") does not recede but instead forms chlorate of soda. It therefore does not burn like the common hypochlorate, and that is why it is so much preferred by laundries as a bleaching agent.

## Two Methods

The best methods of using this solution are the following: (a) Heat the solution to 84 degrees F., and dip the articles for five minutes. Rinse in cold water. The solution can be used over again when this method is adopted. (b) Dilute the solution with twice its own bulk of water and dip the articles for 20 minutes. This is done at normal temperature. Rinse in cold water. The latter method is recommended as preventing the goods from warping or burning and being absolutely foolproof.



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## New Synthetic Resins

(Continued from page 24)

to modify the properties of the final product, and the resulting mixture is then heated, molded, pressed and cured to form a variety of products. The final insoluble and infusible resinous products are fireproof and possess a high dielectric strength and durable qualities, which in combination with their high elasticity make them superior to any other known resinous materials for use in the manufacture of electrical instruments, machinery parts, laminated products and impregnating and insulating media.

Sixteen claims cover the different aspects of this invention.

### Starch-Phenol Resin

We have yet to write a review of the synthetic resin art in which we do not find the familiar name of Emil E. Novotny. In conjunction with his associate, Charles J. Romieux, he is now represented by a patent granted to them July 28, 1931 on a condensation product of phenols and starch, U. S. P. 1,815,930, filed October 19, 1923. The inventors refer back to the Austrian patents 69,375 and 69,377 of January 15, 1915 granted to the Badische Aniline & Soda Fabrik (now part of the I. G.) in which it had been pointed out that phenol would condense with starch, or with sugars, to form resins. This is interesting in view of the recent publicity given to the so-called "new" sugar resins. Novotny and Romieux find, however, that they can produce starch-phenol resins without the use of catalysts, and that thereby much more desirable results can be obtained. The essence of the process consists in mixing starch and phenol and gradually distilling off the excess of the phenol.

A mixture of 100 pounds of commercial corn starch and 150 pounds of commercial crystalline phenol are placed in a pressure resisting container which

PLASTICS & MOLDED PRODUCTS

is heated to a temperature of 480° F. for a period of 2 to 3 hours. The pressure is then gradually released, allowing any uncombined phenol to escape into a suitable condenser.

(To be concluded)

### Paint and Varnish Resins

(Continued from page 12)

proved. The particular qualities of Durez oil soluble resins are the non-skinning features and the unusual adhesion. The lack of adhesion common in phenolic resins is caused by the skin dry or surface dry of the film, leaving a soft protected film underneath which does not adhere well to the surface. The Durez resin being truly soluble and combining in a physical-chemical fashion with the china wood oil, gives a film which advances and sets uniformly and while its actual cure time is not quite as fast in the initial dry as it is with the oil insoluble fluxed type of resin, when the film does cure, it cures completely all the way through. This together with the adaptability of the resin seem to be the outstanding features. Durability has been stressed to a point where it is almost overdone, but the ability to combine any type of gum, any type of oil, and the ability to use cheaper oil such as fish oil and cheaper gum such as raw rosin in conjunction with the high-grade phenol resins are important points. The type of dryer and type of formulation is really still a varnish maker's proposition as dryers affect the film only. Durez technical men recommend only certain type formulae which indicate how to use the product to get it into complete solution in the resin. The actual varnish formulation is left to the varnish makers.

The availability of a resin of this type, not only in replacing but improving upon the diminishing sources of fossil gums, brings to the front again the manner in which synthetic chemistry meets emergencies and how research, in replacing natural products, generally improves on them.

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# TECHNICAL ABSTRACT SECTION

## A Review of Literature and Patents

### Cashew Nut Shell Oil Composition.

Mortimer T. Harvey, of East Orange, New Jersey, assignor to the Harvel Corporation, of Newark, New Jersey. U. S. P. 1,821,095; Sept. 1, 1931.

In the method of getting a reaction product of cashew nut shell liquid and formaldehyde into solution, which produce passes through a soluble state during the producing reaction to an insoluble state, and which method comprises bringing the reaction agents together in a material which is a solvent for the reaction product in the soluble state; the step which comprises heating the cashew nut shell liquid to about 600° F. before said liquid and formaldehyde are brought together.

A composition of matter obtained by heating cashew nut shell liquid, and then subjecting the heat treated liquid to the action of formaldehyde in a solvent for an intermediate reaction product of said materials.

### Cyanogen Halide Derivatives of Cellulose.

Josef Haller, of Wiesdorf, Germany, assignor to I. G. Farben- of Frankfort-on-the-Main, Germany. U. S. P. 1,817,994; Aug. 11, 1931.

20 parts by weight of cotton are treated at ordinary temperature with a mixture of 60 parts by volume of caustic soda (33%), 60 parts by volume of alcohol and 30 parts by volume of water for about ½ hour. The alkali cellulose thus obtained is then pressed off and caused to be reacted upon by a solution of 6 parts by weight of cyanogen bromide in 20 parts by volume of carbon tetrachloride. Reaction takes place with self-heating and after about ½ hour the reaction product may be pressed off, rinsed, acidified, rinsed again and dried. The product thus obtainable appears to be very similar to cotton but shows a nitrogen content of about 1.9%.

### Ethylation of Cellulose.

Donald B. Bradner, of Hamilton, Ohio, assignor to E. I. Du Pont De Nemours & Company, of Wilmington, Delaware. U. S. P. 1,813,726; July 7, 1931.

10 lbs. cellulose, 10 lbs. water, 10 lbs. potassium chloride, 40 lbs. caustic soda, 50 lbs. ethyl chloride, and 87 lbs. benzene are charged into an autoclave. The mixture is agitated and heated for 5 hours at 150° C. The excess ethyl chloride and benzene, with some alcohol and ether, are removed from the reaction mixture by steam distillation. The ethyl cellulose which remains as a fine granular mass is washed thoroughly. The washing treatment may include a treatment with dilute acids. Yield—14 lbs. The product is directly utilizable for technical purposes.

### Making Cellulose Nitro Acetate.

Ludwig Lock, of Dormagen-on-the-Rhine, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, of Frankfort-on-the-Main, Germany. U. S. P. 1,817,994; Aug. 11, 1931.

Example 1.—One part by weight of cellulose is heated at 70° C. with 5 parts by weight of acetic anhydride, 3 parts by weight of glacial acetic acid and 0.05 parts by weight of ammonium nitrate with the addition of 0.003 parts by weight of sulfuric acid until a test portion is found to be soluble in chloroform. The triacetate contains 0.6% of nitrogen (calculated on the cellulose). The resulting nitro acetate is then hydrolized according to one of the known processes.

Example 2.—One part by weight of cellulose is heated at 100° C. with 4 parts by weight of acetic anhydride, 2 parts by weight of glacial acetic acid and 0.5 parts by weight of ammonium nitrate with the addition of 0.004 parts by weight of sulfuric acid until a test portion is found to be soluble in chloroform. The triacetate contains 1.5% of nitrogen calculated on the cellulose. It is then hydrolized according to one of the known processes.

### Manufacture of Cellulose Acetate.

Lloyd M. Burghart, of Baltimore, Maryland, assignor to U. S. Industrial Alcohol Co., of New York, N. Y. U. S. P. 1,816,564; July 28, 1931.

The process of making a cellulose ester of an organic acid, which comprises treating the material to be acylated with an acetylating agent in the presence of a menstruum comprising liquid sulfur dioxide.

The process of making a cellulose ester of an organic acid, which comprises treating the material to be acylated with an acylating agent in the presence of a catalyst and of liquid sulfur dioxide as a menstruum.

### Solubilized Nitrocellulose.

Carleton Ellis, of Montclair, New Jersey, assignor to Ellis-Foster Company. U. S. P. 1,816,146; July 28, 1931.

The process of making solubilized celluloid which comprises exposing stripped nitrocellulose film for a short time to an intensive heat at or near the puffing point.

The process of making solubilized celluloid which comprises passing stripped nitrocellulose film continuously through a heated zone at a temperature above 150° C. but not exceeding the puffing point of said nitrocellulose, the exposure to heat being for a period not exceeding approximately five minutes.

As a new product celluloid solubilized by brief exposure to a temperature of 160° C.

As a new product celluloid solubilized by exposure for a period not ex-

ceeding five minutes to a temperature near the puffing point.

### Changing Solubility of Cellulose Acetate.

Cyril J. Staud and Charles S. Webber, of Rochester, New York, assignors to Eastman Kodak Company, of Rochester, New York. U. S. P. 1,813,685; July 7, 1931.

In the process for the preparation of organic esters of cellulose, the step which comprises hydrolyzing the cellulose ester in a bath containing an oxide of nitrogen.

In the process for the preparation of cellulose acetate the step which comprises hydrolyzing the cellulose acetate in a bath containing an oxide of nitrogen.

In the process for the preparation of cellulose esters the step which comprises adding to the hydrolyzing bath an acetic acid solution containing an oxide of nitrogen.

### Process of Purifying Cellulose Ethers.

Eduard Dörr and Otto Leuchs, of Elberfeld, and Leo Rosenthal, of Vohwinkel, near Elberfeld, Germany, assignors to I. G. Farbenindustrie Aktiengesellschaft, of Frankfort-on-the-Main, Germany. U. S. P. 1,814,208; July 14, 1931.

Example 1.—2 kgs. of ethyl cellulose containing 46% of ethoxy groups are dissolved in 40 kgs. of ligroin, boiling at 110° C. (or in Bornylan) at 80-90° C., filtered hot, if necessary, through a filter press and then cooled to room temperature in a stirring vessel with thorough stirring. The ethyl cellulose is precipitated as a fine flaky product. After drying it is obtained as a fine, flaky very spongy, pure white product, which dissolves smoothly in the customary solvents to give completely homogeneous solutions.

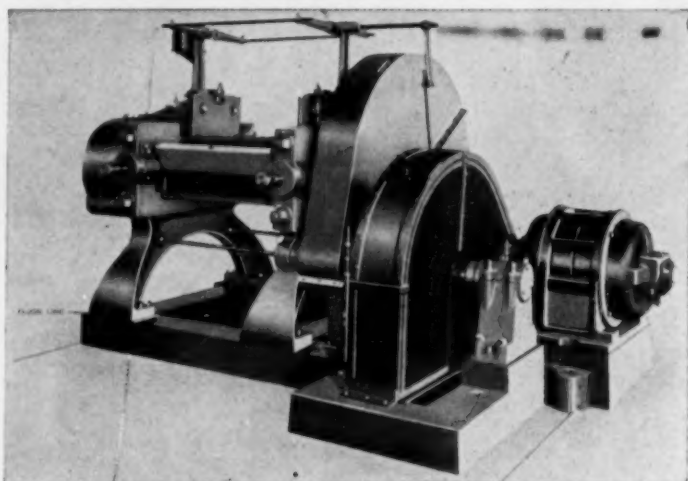
Example 2.—Ethylcellulose with an ethoxy content of about 42% is dissolved in 20 to 25 times its weight of benzene at 80° C. The solution is filtered hot and then cooled to room temperature in a stirring vessel with thorough stirring. The ethyl cellulose is filtered and dried in a vacuo.

Example 3.—2 kgs. of ethylcellulose having an ethoxy content of 44% are dissolved in 40 kgs. of a mixture consisting of 1 part of benzene and 1 part of Bornylan at 80-90° C. and filtered while hot. The further working is effected as described in Example 1.

### Process of Making Cellulose Ethers.

Paul C. Seel, William R. Webb, and John M. Donohue, of Rochester, New York, assignors to Eastman Kodak Company, of Rochester, New York. U. S. P. 1,813,665; July 7, 1931.

The process of making cellulose ethers which comprises first preparing alkali cellulose by adding to a given weight of cellulose, only that



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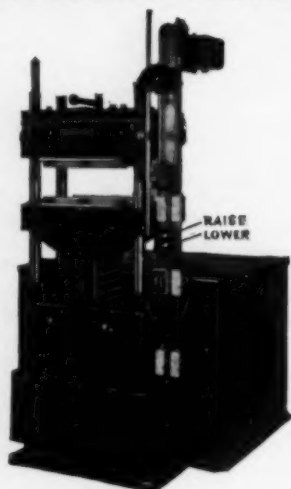
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amount of water which is to remain in the alkali cellulose, which amount of water is substantially less than the amount of the cellulose, and separately therefrom adding only the amount of caustic alkali which is to remain in the alkali cellulose, which amount of caustic alkali is substantially greater than the amount of cellulose, and thereafter mechanically working the mixture into a uniform mass, the said addition of water and alkali being in any order, and thereafter subjecting such alkali cellulose to action of an etherifying agent, at a temperature between about 90 and 170° C.

**Iodo-Benzene as a Cellulose Ester Plasticizer.** Stewart J. Carroll, of Rochester, New York, assignor to Eastman Kodak Company, of Rochester, New York. U. S. P. 1,813,662; July 7, 1931.

A composition of matter comprising 100 parts cellulose acetate and from about 10 to 50 parts, by weight of iodo-benzene.

**Apparatus for Production of Very Thin Foils from Soluble Cellulose Derivatives.** Arthur Eichengrün, of Charlottenburg, German, assignor to Celanese Corporation of America. U. S. P. 1,824,337; Sept. 22, 1931.

An apparatus for producing continuous film bands of cellulose derivative, the combination of supply means for a solution of cellulose derivative, a travelling band repellant to the said cellulose derivative when solidified and passing beneath said supply means, and means for removing said cellulose derivative solution solidified from said band, said band being arranged in the form of loops uniformly individually positively driven and supported by its borders only.

**Formic Acid Ester of Diethyl Ether of Cellulose.** Gerhard Balle, Hans Lange, and Karl Ost, of Frankfurt-on-the-Main-Höchst, Germany, assignors to I. G. Farbenindustrie Aktiengesellschaft, of Frankfurt-on-the-Main, Germany. U. S. P. 1,823,847; Sept. 15, 1931.

200 grams of diethylcellulose are dissolved in 800 grams of formic acid of 90 per cent. strength and the solution stirred during 6-7 hours at ordinary temperature. The solution is then poured into water and the deposited product is washed with water until neutral and then dried. The ethylcellulose formate thus obtained contains about 39-40 per cent. of  $\text{OC}_2\text{H}_5$  and 7-8 per cent. of formic acid. This formate is entirely stable and waterproof.

100 grams of water-soluble methyl cellulose are dissolved in 900 grams of formic acid of 90 per cent. strength and the solution thus obtained is thoroughly stirred for about 24-30 hours. The solution is then poured into water. The precipitated methyl cellulose formate is washed and dried. It is insoluble in water, but soluble in organic solvents.

**Making Cellulose Acetate.** Harry Le B. Gray, of Rochester, New York, assignor to Eastman Kodak Com-

**PLASTICS & MOLDED PRODUCTS**

pany, of Rochester, New York. U. S. P. 1,823,359; Sept. 15, 1931.

In the process of making cellulose acetate, treating cellulosic material with acetic anhydrid and a catalyst in the presence of a mixture which dissolves the cellulose acetate produced, said mixture comprising an amount of acetic acid insufficient, by itself, to dissolve said cellulose acetate and a volatile, organic liquid, substantially immiscible with water and inert toward acetic anhydrid, which co-operates with said acetic acid to complete said solution, the final reaction mixture containing dissolved cellulose acetate being treated in an aqueous precipitating bath which has a temperature above the boiling point of said volatile liquid.

**Esterifying Cellulose with Vapors of Lower Fatty Acids.** Hans T. Clarke and Carl J. Malm, of Rochester, New York, assignors to Eastman Kodak Company, of Rochester, New York. U. S. P. 1,823,350; Sept. 15, 1931.

In the process of making a cellulose ester of a fatty acid, heating esterifiable cellulosic material in the vapor of a fatty acid having more than one and less than eight carbon atoms at a temperature above 100° C. and below the temperature at which the product is degraded until the acetyl group in the ester thus produced reaches at least 4%, said vapor being the sole acetylating agent.

**Nonexplosive, Noninflammable Soluble Cotton.** Fernando Somoza Vivas, of New York, N. Y., Assignor to International Fireproof Products Corporation, of New York, N. Y. U. S. P. 1,822,254; Sept. 8, 1931.

To carry out the process of the invention a solution of magnesium chloride and boric acid in alcohol is first prepared, in the preferred proportion of one-half pound each of the chloride and boric acid in one gallon of alcohol. Other alcohol soluble chlorides may be substituted for magnesium chloride. It is preferred to use absolute ethyl alcohol but other common alcohols as methyl alcohol may be adopted and come within the spirit of the invention.

The nitrocellulose as received wet from the last washing to which it is subjected during its manufacture is run into a mixing tank and is saturated and thoroughly mixed with the above described solution. After thorough saturation with the solution, the material is treated by compression or centrifuge to extract substantially 70 per cent of the solvent from which the alcohol may be recovered in any usual manner.

The thus treated material is next mixed with perchlormethane in the preferred proportion of equal weights of the material and perchlormethane. After thorough mixing the perchlormethane is extracted by compression or centrifuge to leave the dry material of the invention. The perchlormethane when removed takes with it the remainder of the alcohol of the first solution.



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Fig. 1

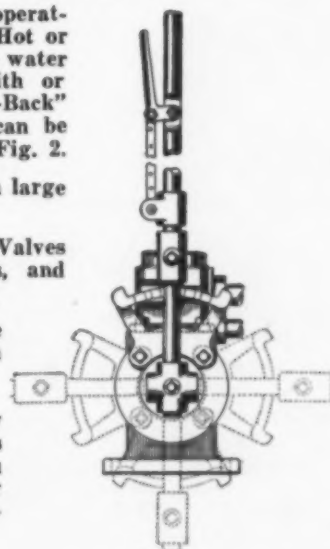


Fig. 2

Established 1872.

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Other books quoted on request.

**Book Department, *Plastics* --- 114 E. 32nd St., New York**

## And Now, In Closing:

**B**Y rights, after seeing 1931 perspire to a thankful close, we should leave this page blank . . . However, that would mean a bad start for the printing business . . . The C. & O. R. R. has some swell molded lampshades in its cars. . . the game "Sweepstakes" uses a nice molded board . . . (don't bet on races) . . . Friend Backscheider had an inquiry awhile back . . . client wanted to know if apples could be stored in an empty drum! . . . Many of our friends in the industry are planning a visit to the British Industries Fair in February . . . Shaw Insulator rounds out its fortieth year, with our congratulations . . . J. K. Kelleher forms the Boston Moulded Products Co. . . American Record acquire from Warner Brothers the record division of Brunswick . . . W. L. Kempton, well known to most of us, is now in Florida working on citrus fruits . . . no, he is not molding them! . . . Libby-Owens-Ford take over Triplex . . . Other large companies, following the Columbia Phonograph example, will soon be in the molding game . . . The most persistent rumor in the tube-base field has Sylvania doing their own . . . The (!) publication "Slapsticks" is not one of ours! . . . Vitreolite takes away some laminated outlets . . . but that field ought to have some big news, soon . . . Amos and You-know, moaning about the fire caused by a pyroxylin ash-tray, have no excuse . . . they don't make them, Mr. Pep-sodent . . . Remember this one: "Prosperity is just around the corner"? . . . well, its a long lane, as it always is, and 1932 may find the turn . . . We hope it does, like Tiny Tim, for all.

**T**HE January 2 *Literary Digest* on "The Approach of the Plastic Age", a synopsis of Chemist Hessel's and *Wall Street Journal* man Self's story in *Barron's* (Nov. 30—have you read it?), says—"When the

next bull market comes, the big chance is likely to be in the new industries": and quotes our own *Plastics Primer* — "The trends of the day indicate a continuing and expanding demand for plastics and molding materials."

**O**NE eye on America, one eye on England, a hand on Germany and a hand on Italy; both feet secure and pockets filled; France dominates international politics and finance. She deserves credit for her rapid recovery from near-oblivion, but she also deserves the reverse for her present policies and persistent subtle cloudiness. In many ways, this country merits the same. Ill-conceived legislation has had even poorer enforcement; politics has played all too great a part in business; European affairs have often excluded domestic matters, their equal in importance. To the nations, money is being cheerfully given, and the business man gets nothing but calls for "More, More." What is the answer, where is the solution? Above all what is each one of us to do in our daily life?

There is no authoritative answer or solution, though there are hundreds of opinions. Matters may get worse, or slowly better. War may be avoided in Europe, or it may be sought to the terrible end. The picture is complete.

In our own lives, we must undergo a reversion to safe, sane and honest business policies. Politics, in our particular field, must be a stranger. Many strong industries will feel the effects of mismanagement, and many companies will topple. Out of the many, in this Industry, a few will be chosen—by Elimination—to carry on the growth already promised. Nobody can see beyond the present, but it is only good economics to reason that the burdensome portions of any industry are eventually eli-

minated, and that full industrial stature is never reached until that time.

Too many excursions into the other fellow's back-yard. That is the obvious conclusion drawn from the last two years. Sound as the *Plastics Industry* really is, it must go through the same evolution that has characterized every other since time immemorial.

The urge to present a good picture is universal. Yet the true Editor, no matter how commercial, realizes that truth must always be painful—and must be told. In times such as these, particularly, it is a difficult task to blame an entire industry for the sins of a few. Moreover, it is not justified. Our Editorial, last month, blamed many, and rightly so. It was not motivated by personal desires, but by the facts that any one can accumulate. Yet it is a relief to read, in our daily mail, the comments and suggestions of those who have courage to admit an error, and of those others who have been steadily courageous.

Tending to business and doing it honestly might well be a cure for international as well as industrial problems.

**W**E went fox-hunting the other afternoon. It happened while we were in Pennsylvania, and had headed for the Synthane plant from way out in Chestnut Hill. Had to change at the 30th Street, Pennsylvania station, and found that our train would leave one minute before we arrived. So we spoke to the conductor, in the universal language, and he then "would do something." He did. They held the train three minutes for our connection. And we ran down and up stairs to make it. The Fox-hunt? Well, at the foot and top of every stairway was a guard. Every one of them, in sequence, shouted "Oaks! Oaks! Oaks!"

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